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ABSTRACT

This manual is designed to provide the background needed by counselors to evaluate and select a computer-assisted career guidance system (CACGS) for their institution or agency. The manual is comprised of nine chapters. Chapters 1 and 2 explore the career planning process and the terminology used in computerized guidance, while chapter 3 combines the terminology and issues raised in chapter 2 into a procedure for evaluating a CACGS. In chapters 4-7 this framework is used for a comparative analysis of four major systems. The four CACGS reviewed in the manual were selected because they illustrate variety and are among the oldest, best researched CACGS in use today. (Other CACGS are mentioned in the appendices.) Chapter 8 provides an explanation of how to integrate the CACGS into the counseling process. Chapter 9 focuses on the future of computerized guidance in an effort to direct the user's thoughts to the improvements and advances desired in future systems. Appendices to the manual are designed for quick reference. Appendix A contains a glossary. Appendix B contains a brief review of the major systems available today, while appendix C describes a condensed procedure for evaluating CACGS. Appendix D lists addresses of persons to contact for assistance in planning a CACGS. (KC)

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HOW TO SELECT A COMPUTER-ASSISTED CAREER GUIDANCE SYSTEM

BY

MARILYN MAZE
AND
ROGER CUMMINGS

U.S. DEPARTMENT OF EDUCATION
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HOW TO SELECT A COMPUTER-ASSISTED CAREER GUIDANCE SYSTEM

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Table of Contents

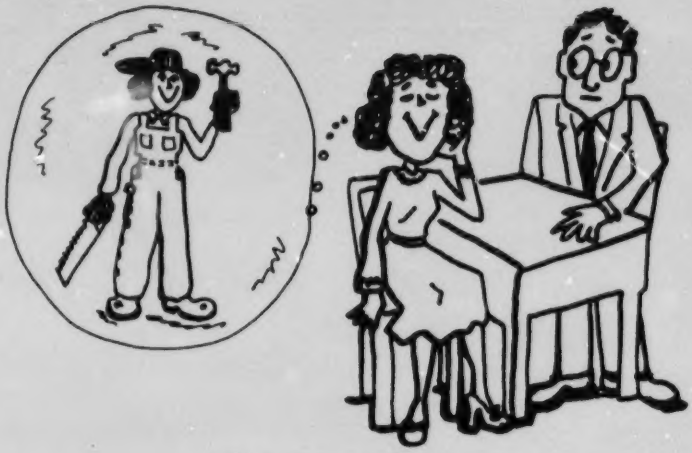
1. Introduction to the Career Planning Process 3
2. Introduction to Computer-Assisted Guidance 15
3. Evaluation Criteria for Comparing Computer-Assisted Career Guidance Systems (CACGS) 33
4. Analysis of the Career Information System (CIS) 53
5. Analysis of the Guidance Information System (GIS) 67
6. Analysis of the System of Interactive Guidance and Information (SIGI) 79
7. Analysis of DISCOVER 97
8. Organizational Planning 109
9. Future Development 119

Appendix A: Glossary 129

Appendix B: Comparison of Computer-Assisted Guidance Systems 137

Appendix C: Evaluating a Computer-Assisted Career Guidance System 146

Appendix D: Resource Centers for Vocational Guidance 151



Chapter One

INTRODUCTION TO THE CAREER PLANNING PROCESS

Computers seem to be invading every aspect of our lives, but how can a computer provide counseling services? Is it possible that a machine can understand a complex human being and provide assistance on personal issues? Computer terminals are rapidly springing up in counseling offices throughout the United States and Canada. Clients enthusiastically crowd the counseling offices to use them and counselors are amazed by the services they offer. But can they counsel?

The most common use of computers in counseling is currently in the area of career planning. Computers clearly improve the quality of career counseling services in two ways. First, career planning involves selecting appropriate occupations from the extensive array of occupations available in the world of work and computers are very good at sorting. Secondly, career planning requires access to extensive information which must be continuously updated and computers are excellent for easily updating and rapidly accessing

information. This success with the use of computers has encouraged counselors to experiment with delegating other guidance activities to computers, especially activities like teaching new concepts or assessing clients' abilities or personality traits.

Experimentation continues as computers become more widely used for counseling services. It is not yet clear which services computers can perform and at what point a human counselor is needed. It is clear that computers are valuable to career counseling for objectively sorting occupations and providing current information. Experimental evidence appears also to support the use of computers for some self-assessment activities. This manual will describe the use of computers in career counseling and point the way for you to assess the value to your institution of using computers to provide services. The concepts explained here will also be useful in determining the potential of computers to assist in other aspects of counseling.

As you read this manual, keep this question in mind: Which services do I want a computer to provide and which services can best be provided by a human counselor? As you become more familiar with the strengths and limitations of computers, you will join a small but growing group of counselors and educators who are exploring this issue and providing the concepts for the next generation of computerized guidance systems.

I. OVERVIEW

The major purpose of this manual is to provide the background needed to evaluate and select a computer-assisted career guidance system (CACGS) for your institution or agency. To supplement this manual, you will need to gather promotional literature and other information about the systems you are evaluating and to experience them yourself.

Before beginning the evaluation of a CACGS, it

is important to understand the career planning process (Chapter One) and the terminology used in computerized guidance (Chapter Two). Chapter Three combines the terminology and issues raised in Chapter Two into a procedure for evaluating a CACGS. In Chapters Four through Seven this framework is used for a comparative analysis of four major systems. The four CACGS reviewed in this manual were selected because they illustrate variety. They are among the oldest, best researched CACGS still in use today and they are systems which are relevant to a broad cross-section of the population. Other CACGS which could have been chosen are mentioned briefly in the appendices. But after seeing how these evaluation criteria can be applied to four systems, you should be able to use them in evaluating other CACGS.

Chapter Eight provides an explanation of how to integrate the CACGS of your choice into the counseling process. Careful preplanning will help to assure that this valuable new tool is used fully and appropriately. Chapter Nine focuses on the future of computerized guidance in an effort to direct your thoughts to the improvements and advances you would like to see in future systems.

When you have finished reading this manual and are conducting your search for a CACGS, you may wish to review some of these concepts quickly. The Appendices are designed for speedy reference. Appendix A contains a glossary; Appendix B contains a brief review of the major systems available today; Appendix C contains a condensed procedure for evaluating CACGS; and Appendix D contains addresses you may wish to contact for assistance in your search.

II. CAREER DEVELOPMENT

What is career development? As used here, the word "career" includes all of the productive activities in which one participates during one's life. A person's career continues to develop with

each new occupation or leisure activity chosen. Unlike an occupation or vocation, words which refer to specific categories that exist outside of the individual, a career is one's personal way of going through life.

How can a CACGS facilitate career development? Each person matures at a different rate and faces new career choices at different stages of life. It is not easy to find order in this process. Although several theoreticians have offered definitions and descriptions of the process, much remains to be learned about the effects of life experience, personality and opportunity on career choice. However, since CACGS are designed to facilitate this process, it is necessary here to describe a few basic principles which allow the CACGS to be seen in perspective.

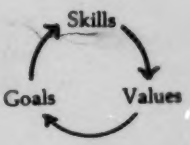
Lifelong Development

First, career development is a continuous process throughout life. In modern American society there is no point at which the final choice must be made. Whether we are choosing between dramatically different life paths, deciding to reject or accept a new task at work, or selecting retirement activities, we are continuing our career development. The child of eight who pretends to be a policeman and the Ph.D. doing postdoctorate work on an esoteric subject both have the option of changing their minds and doing something completely different.

Reinforcement Process

Second, it appears that the choice of a career reinforces itself and grows stronger over time. In childhood we learn a set of values from our parents and peers. These values determine our goals, and achieving these goals builds skills. As we reach our early goals and come in contact with other value systems, we may change our values, acquire new goals, and develop new skills. These skills reinforce certain values, since we tend to value those tasks in which we have experienced success. Our skills also gain entry for us into work-related social groups in which similar but more highly refined skills are valued. The pianist, for example, makes

friends with other pianists who value specific types of music to the exclusion of many other life activities, learns to value perfection in that type of music, and makes it a goal to perform at a very high level. And the cycle continues, reinforcing itself as it goes.



Change Process

Other forces act to pull us away from our previous choices. Our society teaches us to expect happiness. Whenever we experience the pain of failure, are forced to work with people we don't like, or feel the frustration of overwhelming barriers, we begin searching for a better option. We begin to wonder if it would be possible to make more money, have more leisure time, advance more quickly, have a more pleasant work environment, or have less stress. Thus the search for other options begins.

If we find encouragement, we begin to investigate new plans or jobs and gather information about the advantages and disadvantages of making a change. If we find a promising new alternative, we make the change and test the new situation to see how much happiness it brings. If this testing period confirms our choice, we devote more energy to developing the new skills needed to do well in this endeavor. But the searching continues in a less intense way. Many people never stop wondering if they might be happier doing something else.

Stages of Development

Although this process continues throughout life, external factors force us to make choices at specific points whether we are ready or not. For most people the process looks something like this:

Age Range	Choices
0—12	Academic success or failure
12—16	College preparatory or vocational courses
16—18	Specific training program
18—25	Initial vocation(s)
25—40	Major vocation
40—65	Impact on society
65—?	Leisure activities

In the early years (0-12) children imagine themselves in a variety of occupations. Simultaneously their self concept is developing and is being influenced by their success or failure in school. Socioeconomic factors, family, and peers influence a child's concept of success and instill deeply rooted expectations for the child's role in life. Then in eighth grade most students must choose between an academic or a vocational program. In some respects, this choice is irrevocable, even though the students may have little understanding of its importance.

Later in high school students must choose to enter their first job or continue training or college. For those who are eligible for college, higher education may provide an opportunity to postpone occupational decisions. But choices are soon forced upon them with course selections, majors, then the job search.

Many people use the period from 18 to 25 to sample a variety of jobs (Levinson, 1978). Their firsthand experiences help them to clarify their needs and goals. Those who learn from their mistakes make a fairly deep commitment to an occupation by their late 20's and begin creating a niche for themselves. A significant number of

people use this period to raise families. Some people advance in business, industry, or public sector jobs and assume large amounts of responsibility.

After 40 many people begin to feel differently about their work. Often the thrill of mastery has worn off, or families have grown, and a great deal of wisdom has been gained. This can be a time to branch out and make an impact on society or try a new type of endeavor. The need to prove oneself may be less important and the emphasis may shift to finding more meaning, enjoyment, or satisfaction in life. Writers, politicians, and philosophers often emerge at this stage of life.

After 65, society no longer expects a contribution and there are younger people asking to be given a chance. Some people choose pure leisure, while others find a way to blend leisure and productive activities.

Career choices may be made at each of these stages, either planfully or by accident. Many of these choices are forced on the individual, whether he/she is ready or not. Research consistently reports that students in high school and college perceive themselves as unready for these choices and fault the school system for not preparing them for making these decisions (H.E.W., 1969). Community counseling agencies have also reported that many adults do not feel prepared for these choices.

Vocational Maturity

These are the points at which career counseling is most often needed. Counselors may choose to intervene at these points or before they occur to prepare clients to make wise career decisions and to facilitate vocational maturity. "Vocational maturity," an important goal of career counseling, is the readiness and preparation for making a wise decision. It includes a realistic perception of one's strengths and abilities in relation to oneself and to others; knowledge of the world of work, the variety of choices available, and the requirements and rewards offered by relevant occupations; and

the ability to make rational decisions. An individual who has a high level of vocational maturity will be more prepared to make a wise decision when the choice point occurs.

III. CAREER PLANNING PROCESS

Since choice points occur several times in each person's life and since they are spaced so far apart in time, one of the most effective ways to assist clients is to teach them the career planning process. Then they can use this process by themselves or with the assistance of a counselor when they again face a career choice. Counseling also attempts to increase overall vocational maturity by explaining the structure and economics of the labor market, teaching job search skills, and building awareness of job holding skills.

Personal Review

The career planning process (see Table 1) begins with a review of the individual's past experiences. In this step the client evaluates areas of success and failure, finds the threads running through his/her career, and identifies the needs which he/she expects a job to fill.

Assessment

Next there is some type of assessment. This can be done by the client alone, individually with a counselor, in a group using structured exercises, or through testing. Usually a combination of these is used. Tests give standardized, objective results while structured exercises draw out hidden dimensions of the individual's personality using the individual's own vocabulary. Assistance of friends is often sought to help the individual recognize and acknowledge strengths that are visible to others.

Decision Making

The decision-making process begins by identifying occupational options. A wide variety of counseling tools is available to assist people at various stages of career development. For younger people, the relevant options may be career clusters. For teenagers, they may be occupations or families of occupations. For mature adults, the options often are very specific distinctions between actual

STEPS	POSSIBLE ACTIVITIES
I. Personal Review	Analysis of past experience
	Career path assessment
	Identification of needs
II. Assessment	Goals
	Values
	Interests
	Personality
	Skills
	Aptitutes & Abilities
	Motivators
III. Decision Making	Identify options
	Gather information
	Assess desirability of options
	Assess risks
	Select goal
IV. Planning	Assess skills needed
	Identify training opportunities
	Identify resources for job openings
	Outline plan
V. Implementation	Education or training
	Volunteer, temporary, or part-time jobs
	Professional organizations
	Personal development workshops
	Networking
	Job search

TABLE 1.
The Career Planning Process

jobs. Conventional occupational assessment instruments (such as interest inventories or aptitude tests) identify either clusters of 6 to 16 categories, or occupational families of 100 to 200 categories. CACGS identify clusters of 6 to 30 categories, and occupational families of 200 to 900 categories. Thus CACGS offer greater detail than

conventional instruments while providing immediate feedback and the opportunity to change one's mind. They serve children, teenagers, and some adults very well. Mature adults who are "fine tuning" their career choices may need a level of detail which cannot be addressed by CACGS and requires research in the labor market.

Once options are identified, it is time to gather information. Although there are several occupational information resources available, CACGS provide the best, most up-to-date information available in written form since they can be updated regularly and can be localized to the region in which the client lives. More detailed and current information can be obtained by interviewing people working in each occupation, when it is possible to do this.

Next, clients need to assess the desirability of each option, and then the risks involved. It is very important to provide some type of assistance at this point since this process requires a great deal of maturity and sophistication. Very few clients see themselves accurately. Most will either underestimate or overestimate their skill or ability in some areas. Some CACGS help clients with this step. However, human follow-up is desirable to find out how the client made his/her decision so that inconsistencies or incorrect assessment of the risks involved can be noted. Although a CACGS can be very effective in noting inconsistencies, none yet developed can provide the counseling needed to uncover the hidden fears and frustrations that trap the client in an unsatisfying choice.

Planning

A CACGS can be especially useful in the planning stage. Most CACGS are very clear about the skills needed for each occupation and quickly refer clients to the training programs available in their area. Resources for the job search are often also mentioned. However, the outlining of a plan may require human intervention.

Implementation

When implementing the plan, the client leaves

the CACGS and works alone, possibly with occasional follow-up visits to the counselor or by attending a support group through the emotionally draining job search period. If the plan has been well built, the client moves smoothly through this stage and into the job.

Although the choices change as we pass through life, this process remains the same. Sometimes the decision may be made quickly, barely touching each step. At other times the process will be used thoroughly with careful consideration of each step. It is clear that the CACGS is useful for Steps II through IV, (see Table 1) with appropriate counselor supervision and occasional intervention. Some CACGS are designed to deal specifically with each stage. Others suggest options and provide information while leaving the process steps to the counselor. Appendix B contains a chart comparing the contents of several major CACGS in relation to this process.

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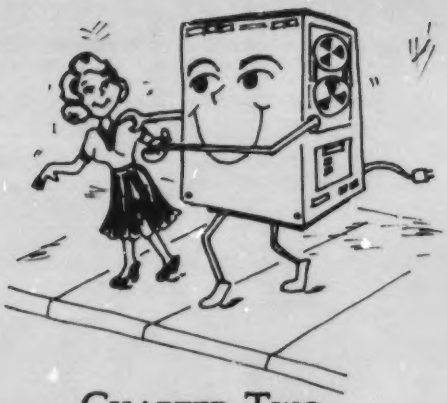

CHAPTER TWO

INTRODUCTION TO COMPUTER-ASSISTED GUIDANCE

This chapter will briefly describe the historical development of computer-assisted career guidance systems (CACGS), then introduce the basic concepts and terminology used in the rest of this manual. As the terms are introduced, many issues are raised which are peculiar to computerized guidance and awareness of these issues will assist in understanding the evaluation criteria used in Chapter Three. This chapter is intended for the counselor or educator who knows nothing about computers, although a bit of hands-on experience will help to make these concepts more concrete. Those who are already familiar with computers will find this chapter useful in focusing on the issues involved in using computers in guidance. It is very brief and provides only essential terminology, but further definitions are provided in the glossary and more in-depth information on computers could be gained from an introductory course in data processing.

I. HISTORICAL PERSPECTIVE

The development of computerized guidance

began in the early stages of computer development, but has had to wait for technological advances to achieve wide usage. One of the earliest computerized systems was called ELIZA, developed around 1963. ELIZA was developed by Joseph Weizenbaum, a communications expert at the Massachusetts Institute of Technology, to simulate natural language (H.E.W., 1969). ELIZA is so successful at simulating a dialogue that it sounds rather like a client-centered therapist. A dialogue between a person and the computer might look like this:

P: I love my mother.
C: Why do you love your mother?
P: Because she's nice to me.
C: Do any other reasons come to mind? (This response is triggered by the word "because.") (H.E.W., 1969, p.83)

ISVD

One of the first CACGS used ELIZA'S programming plus occupational and educational information to simulate a dialogue between a career counselor and a client. This system, called Information System for Vocational Decisions (ISVD), was developed by David Tiedeman and Robert O'Hara at Harvard University Graduate School of Education, 1966 to 1969, through a grant from the U.S. Office of Education. Unfortunately, it was so unwieldy (the computer programming to respond to natural language commands is massive) that it was not cost-effective.

GIS

When the ISVD project ended, several of the faculty and staff began work on an inexpensive information storage and retrieval system, in use since 1971, which is now maintained by Time Share Corporation and called the Guidance Information System (GIS, reviewed in Chapter Five). Unlike its predecessor, GIS understands only a few simple commands and thus is very compact and inexpensive to operate.

Advances in technology stimulated development in the area of computer-assistance guidance. In the

mid-60's new time-sharing computer operating systems were introduced. These systems are very common today because they allow several users to access the computer simultaneously so that the cost per person for computer time is much less. By 1970 minicomputers had arrived. These smaller, less expensive computers used time-sharing much more efficiently than their predecessors so costs of computer time dropped significantly.

ECES

In the late 1960's several other CACGS were developing. IBM funded the development of the experimental Education and Career Exploration System (ECES), initiated in 1966 (H.E.W., 1969), which is still in use in the Genessee Intermediate School District in Flint, Michigan (Clyde, 1979). The Computer-Assisted Career Exploration (CACE) System was developed by Joseph Impellitteri at Pennsylvania State University (1966 to 1968) under a grant from the Pennsylvania Department of Public Instruction (H.E.W., 1969), and is still in use there (Clyde, 1979).

CVIS

The Computerized Vocational Information System (CVIS) was developed at Willowbrook High School in Illinois (1967-1971), by the Director of Guidance, Dr. JoAnn Harris-Bowlsbey, through a grant from the Illinois Board of Vocational Education and Rehabilitation (H.E.W., 1969). This system is still widely used in Illinois, California, and many other states. Its author has moved on to create three more systems which are also marketed nationally, including DISCOVER, which is reviewed in Chapter Seven.

CIS

Funded by a grant from the U.S. Department of Labor, Dr. Bruce McKinlay and others at the University of Oregon developed the Career Information System (CIS) in 1969. CIS (reviewed in Chapter Four) is now widely used in many states which, like Oregon, maintain their own data and operate autonomously.

SIGI

Dr. Martin Katz of the Educational Testing Service began work on the System of Interactive

Guidance and Information (SIGI, Chapter Six) in 1967 and continued field testing and refining it for a decade. Developmental funds came from the Carnegie Foundation, the National Science Foundation, and the Kellogg Foundation. SIGI continues to be marketed by ETS and is widely used.

COIN

In 1975 the Department of Labor funded eight states to develop local career information systems. Four chose CIS, three chose GIS, and Michigan developed its own system which was a synthesis of the other two. The funding lasted for three years. When it ended Dr. Rodney Durgan, creator of the Michigan system, moved to Ohio and began marketing the Michigan system under the name Coordinated Occupational Information Network (COIN) which is widely used today. Of the eight states funded, seven now have viable state-supported systems.

CHOICES

During the mid-70's Dr. Philip Jarvis was developing a system in Canada, the Computerized Heuristic Occupational Information and Career Exploration System (CHOICES, 1976). CHOICES serves much of Canada, using a national telephone network and one computer located in Quebec.

NOICC

In 1976 the National Occupational Information Coordinating Committee (NOICC) was created to facilitate interagency cooperation among the Education and Training Administration, the Bureau of Labor Statistics, the U.S. Office of Education, and the National Center for Educational Statistics. Similar committees were created simultaneously in each state (SOICC's) and in 1980 fourteen states were given grants to develop Career Information Delivery Systems (CIDS). Most of these states used these grants to set up a state wide CACGS with local labor market data.

Local CACGS

Each year five or six more states or local regions adopt one of the major CACGS and add state and/or regional data to form a localized system. As of March, 1982, 17 localized systems used CIS as their base system, 18 used GIS, at least four each

used CHOICES and COIN, and at least two used DISCOVER. States or local regions which are selecting a CACGS will be basing their choice on all the factors listed in Chapter Three, plus larger philosophical and economic issues. CHOICES was free until 1981 (when it was taken over by a private software firm), but there was no technical support available. CIS can be purchased with technical support, but data files must be developed locally before it can be used. The other systems all have national data files to which local data can be added as time and financial resources permit. But since the annual lease fees paid to the national CACGS are based on the number of sites, fees paid by the state or local system to the parent CACGS increase as system usage builds. As a result, some states are now developing their own programs and breaking ties with their original systems.

II. COMPUTERIZING GUIDANCE FUNCTIONS

There are many career counseling tools which utilize computers, so what elements must a system have before it is considered a computer-assisted career guidance system? First, the client must interact directly with the computer via a terminal. Batch-processed instruments (those which must be mailed to a computer for scoring) are not CACGS. These instruments require a waiting period of a few hours to a few days before the client receives the results of the scoring. A CACGS, on the other hand, allows the client to interact directly with the computer and to change responses after observing their impact on the occupational selection process, so the system is said to be interactive. Some CACGS administer assessment instruments by asking the questions consecutively and reporting the results at the end of the questions. This is very similar to batch processing, except that the clients receive the results more quickly. Others are more truly interactive, showing the impact of each choice and soliciting changes immediately.

Batch vs. Interactive

Information Retrieval

Second, a CACGS contains occupational and/or educational information and the retrieval capabilities of the computer make this information more convenient for the client to use. When the client requests the desired information, the computer locates the information and produces a personal copy for the client. This is faster and more fun than looking for the information in a book. Receiving a personal copy of the information has a powerful emotional impact on the client and dramatically improves the client's ability to use and retain the information. This is an important factor to keep in mind when choosing a CACGS or buying hardware.

Updates

Storing this information on the computer also allows the convenience of updating the information frequently without the involvement of the career technician and without throwing away books and/or other materials. In most cases, depending on a CACGS for up-to-date information is more cost effective than maintaining this level of accuracy at your own site.

Guidance vs. Information

CACGS are quite varied in content. First, they can be classified by their emphasis on information or on guidance functions, although all systems have some of both. Those CACGS which emphasize information devote a large proportion of their fees to compiling and producing accurate, up-to-date information. CIS, GIS, and COIN are examples of this type of CACGS. Other systems emphasize guidance and perform a great many functions in addition to providing information. Examples of these systems include SIGI, CVIS, DISCOVER, and ENCORE. Appendix B contains brief descriptions of each of these CACGS.

Access Strategy

Second, the content of the guidance modules varies greatly. All systems have at least one access strategy. An access strategy is an interest, ability, or values inventory which selects appropriate occupations for the client. It is called an access strategy because, by narrowing the list of occupa-

tions to a manageable number, access to the occupational information is facilitated. Computers perform this sorting process rapidly and efficiently so it is reasonable to set high standards for this component of your CACGS.

An access strategy may achieve several guidance functions. By illustrating the selection process, it allows the client to experiment with a variety of choices and see the effect of each decision. By the choices offered, the access strategy encourages self-assessment and clarifies the client's self-concept in the areas covered. It may also inject some realism into the choice process, offering few occupations when contradictory options are selected.

Guidance Modules

Systems which emphasize guidance usually offer more elaborate guidance modules to precede and/or follow the access strategy. Preceding modules may assist the client in self-assessment. SIGI, for example, offers a multitude of challenging alternatives to the values the client initially selects. Thus the client is forced to examine each choice carefully and is offered realistic situations for testing each choice. Other modules may teach important concepts. For example, DISCOVER begins with a module explaining the career planning process.

Cost

CACGS vary in their pricing policies. Obviously, CACGS which emphasize information must be updated frequently. Since information production is very costly, these CACGS cannot be purchased and are available only through subscription or lease. Subscription fees cover the cost of continuing improvements in this rapidly changing field and information production as well as continuing user support functions and materials. A small number of CACGS which emphasize guidance functions or which are updated by the user site may be purchased outright; however, the cost of annual updates for the information components should be anticipated when planning a budget.

Usage Records

Another variable among CACGS is the recording of information about the client. If the CACGS stores the client's identification number and a record of the interaction, the client can stop at designated points and return again later. For CACGS containing modules which may require more than one hour, it is essential to allow clients to interrupt their interaction. CACGS which have rapid entry procedures or short modules often do not keep a record of the interaction. This saves computer storage space and assures the privacy of the client.

User vs. Facilitator

In assessing the value of a CACGS, it is important to understand the difference in perspective between the user and the facilitator. The user is the client, and the facilitator is the counselor, teacher, career technician, or other staff person who assists the user at the terminal. Some facilitators are proud of their CACGS, seeing it as the most advanced and exciting instrument in their career center. Other facilitators feel intimidated by the CACGS because it is beyond their control. When the equipment malfunctions, there is little they can do to correct the problem. And the client is watching while they fumble and fail.

Clients also approach the CACGS with varying degrees of anticipation and intimidation, but once they begin using the CACGS, their perspective changes. Some find the CACGS intriguing and thread their way through the entire system, eager to see all it can do for them. Others find it frustrating because it continually asks its preprogrammed questions and never answers the questions they came with. Or they feel intimidated by the length of time it takes and the multitude of questions, and they want to break out of the routine and get to the answers. Hopefully, the facilitator will recognize the negative reactions and guide the user to the relevant sections or to a counselor.

The difference in perspective between facilitators

and users is especially important in selecting a CACGS since facilitators select it for users. Often, the only way to accurately evaluate the impact of a CACGS on users at your institution is to allow several typical clients to use it.

Degree of Computerization

Some CACGS are largely self-contained and others require extensive intervention from a facilitator. Since computer time is expensive, it is possible to ask users to prepare first by completing an interest inventory or other preliminary questionnaire, then to begin using the CACGS by typing in their answers. Other CACGS guide the client through an orientation to career planning and one or more on-line interest inventories.

When should an assessment instrument be computerized? The Strong-Campbell Interest Inventory (SCII) and the Self-Directed Search (SDS) provide an instructive contrast. The SCII uses a unique set of responses and lengthy statistical calculations to determine the score for each occupation, so it must be scored by computer. The SDS produces scores for six personality types, so its scoring can easily be done by hand and the results can be entered into the computer by entering the two or three personality types in which the client earned the highest score. Any other instrument which produces a small number of personality, interest, or ability categories can be used effectively without computerization.

The balance between maximal computerization and limited computerization depends on the type of usage anticipated, the sophistication of the clients, and the cost which can be borne by your site. The conditions at each site will determine the cost-effectiveness of computerizing each aspect of the career counseling program. Whether maximal or minimal computerization is chosen, facilitators are needed at times to repeat the instructions and to intervene when equipment fails or frustration builds.

Transparent Programming

CACGS interact with the client by asking

questions and waiting for a response. The structure of the interaction is controlled by a program which was designed by the system author. Some programs are very transparent, meaning that the client isn't aware of talking to a machine because it feels like talking to the system author. All CACGS have built-in error handling. This means that clients who push the wrong button will usually get a friendly message telling them what they should have done. Occasionally, the client will surprise the program and a facilitator will need to intervene and get the client back on track.

Menu vs. Key Words

None of the major CACGS is capable of accepting requests from clients in English. Instead, they offer either a menu or key words. A menu is a list of numbered options. After reading the options, the client selects the one he/she desires. Key words are commands which can be used at appropriate points in the program to change direction. The use of key words allows the user to dart in and out of various components, tracking down specific information or pursuing a specific need. Menus are advantageous when the client is moving in the usual way through the system, since the options are clearly laid out in plain English. Key words are advantageous when an unusual need occurs or for highly autonomous users. Key words require the client to read the handbook carefully before beginning and to think independently at each juncture, but they offer the user a great deal more control over the system. Both of these techniques have value and will continue to be used in various situations.

III. INTRODUCTION TO COMPUTER TERMINOLOGY

Hardware vs. Software

Some familiarity with computer terminology is necessary for evaluating CACGS. The first important distinction is between hardware and software. Hardware refers to the computer, terminal, and any other electronic apparatus

needed to run the system. The CACGS itself is called software. There are two kinds of software: programs and data. The programs contain the instructions which operate the hardware. Data refers to all information contained in a CACGS.

Programs vs. Data

Programs are written by computer programmers and each change affects some other part of the system. Thus programs are costly initially, but the same programs may continue to be used for many years with minimal maintenance. Data is compiled by researchers and is usually revised annually. Some CACGS give each site the programs for revising the data in the computer so it can be maintained at the site. Other CACGS accept responsibility for the accuracy of the data and do not allow user sites to make changes in it.

Hardcopy Terminals

Both a terminal and a computer are needed for a CACGS. The user sees and interacts with the terminal, which consists of a typewriter keyboard and paper or a screen where the letters appear when the user types them. Hardcopy terminals look very much like typewriters. The user types a command and the computer causes the terminal to type its response on the paper. This produces a permanent copy of the interaction for the user to keep and discuss with counselors or friends. Typically, each user receives five to twenty feet of paper, including both instructions and occupational or educational information.

CRT Terminals

A terminal which types on a screen is called a CRT (Cathode Ray Tube). A CRT looks like a television screen and both the user's input and the computer's output appear on the screen. So that users can keep the sections they value most, (i.e., a list of occupations produced by the access strategy or information about occupations or educational programs) a printer is usually attached. Of course, these two pieces of equipment cost more than a hardcopy terminal, but each user takes only the essential part of the interaction and the printout may be more concise and easier to read in retrospect.

Telecommunications

The terminal receives the user's input and transmits it to the computer. The computer may be located in the same room, in another building, or many miles away. The computer processes the input and responds almost instantaneously, regardless of the distance.

Hardwiring

There are several ways of connecting the terminal to the computer. Nearby computers may be "hardwired" to the terminal. Like connecting a speaker to hi-fi equipment, this requires only a few feet of the right type of wire. More distant computers are usually connected by telephone. Using a telephone, there are two options: a voice line or a private data line. For computers located in the local dialing area, an ordinary business phone with an ordinary voice line may be adequate. An acoustic coupler converts the terminal's signals to tones in the normal voice range. This voice line can transmit signals at speeds up to 30 characters per second. This is as fast as most people can read, so it is adequate for many CACGS.

Dial-up

Private Dataline

If the CACGS requires faster transmission or if the computer is a long-distance call away, a private data line may be preferable. For this type of transmission, a modem converts the terminal's signals to electronic impulses which can be transmitted long distances without distortion. Since this is a private line, the charges do not depend on usage. The CACGS may be turned on and ready for use all day, and since the quality is better than a voice line, frustration due to equipment problems is lessened. If you plan to use the terminal more than 40 minutes a day over a long-distance line, a lease line may be less expensive.

Transmission Speed

One of the issues which influences the choice of communication modes and terminals is the speed of transmitting characters from the computer to the terminal. Inexpensive hard copy terminals and voice telephone lines transmit data at 300 baud. (Baud rate is a complex computer concept, but 300

baud is equivalent to 30 characters per second or 360 words per minute.) Since this is faster than most people can read, it is usually adequate for a hard copy terminal. CRT terminals usually run at 1200 baud (120 characters per second) or faster. Instead of producing characters as the clients read them, they fill the screen and then pause to enable the client to read the completed page. This is necessary on a CRT because the movement of the lines while you are reading is very annoying. A 300 baud printer can be attached to a 1200 baud CRT terminal, but a faster printer is desirable. It is possible to use an ordinary voice line for 1200 baud transmission, but it is unlikely that this equipment will be dependable over a long period of time.

Time-sharing

The expense of faster equipment must be balanced against the value of speed. Clients can only progress as quickly as they can read, so speed of transmission has little effect on the speed of completion. Computer experts often advise against the slower equipment, but for counseling purposes the slower equipment may be preferable since it is less complex and overwhelming for clients and facilitators.

The computers used for CACGS usually operate in time-sharing mode. Time-sharing means that many terminals are communicating with the computer at the same time. The computer checks the first terminal for commands. It responds to one command, then goes to the next terminal. Because it operates so quickly, fifty or more terminals may be connected and each terminal seems to have the attention of the computer. Actually, the expense of having one user monopolize a computer costing many thousands of dollars would be prohibitive. So time-sharing is essential for a CACGS which uses a large computer.

Micro-computers

Microcomputers are the exception. Because microcomputers cost only a few thousand dollars, they are often used without time-sharing. A microcomputer may be located in the same

container as the keyboard or placed in a small box beside the keyboard. There are no transmission lines and usually only one user communicates with the computer at a time. Typically a CRT is set above the keyboard and a printer may be attached to one side.

Microcomputers have many advantages over time-sharing in small counseling centers which do not have access to a computer, but storing the massive amounts of data usually contained in CACGS on a microcomputer is still quite expensive. Many CACGS now offer microcomputer versions in which the access strategy is computerized and the data is stored in books or on microfiche. The hardware for this two-part system is much less expensive, but this system is less attractive for clients.

IV. ADVANTAGES OF COMPUTERIZATION

CACGS can facilitate three aspects of career guidance:

1. Interactive instruction in the career planning process
2. Instantaneous and flexible occupational selection
3. Relevant, timely, and meaningful information

Not all CACGS attempt to teach the career planning process, and these concepts could be covered by counselors or teachers, but computers may be more effective and less costly than their human predecessors in explaining the basic material. Although some counselors fear that computers may replace them, others recognize the extensive repetition in counseling that now saps counselors' energy and creativity. With CACGS covering the basic, repetitive functions and increasing the vocational maturity of clients, counselors can use their time more effectively and creatively to assist in resolving a variety of personal issues and meeting specialized needs.

Improved Quality

CACGS do not decrease the need for counselors,

but rather stimulate the need for higher quality counseling. According to research conducted by the Educational Testing Service, "Counselors do not perceive SIGI as taking over the burden of career counseling. Rather, it improves the quality of counseling sessions. Students arrive for their appointments with a better background, with better formulated goals, with more occupations in mind, and with a more structured approach than do non-SIGI users"(Chapman, 1977, p. 13). On the other side is the students' preference for using both the CACGS and a counselor's assistance. The same report (p. 14) finds that "...students prefer a combination of SIGI and counselors for help in most activities directed toward career choice."

Increased Knowledge

Research also shows that clients who use CACGS have more confidence in their vocational decisions and know more about the occupations they are considering than clients who receive only conventional counseling. A study of the effects of using the Career Information System indicated that those who used the computerized system knew significantly more about the occupations they were considering (McKinlay, 1980). Another study indicated that three out of ten users changed their career plans as a result of using CIS. Research on the effects of using other CACGS has produced similar results. DISCOVER, for example, found that prior to using the system, 14% of their sample "had no idea about their future plans," but none chose this response afterward (Rayman, 1978, p.356).

Enjoyable

In addition to providing significant assistance with career choice, CACGS are fun to use. Statistics indicate that from 75% (Rayman, 1978, p. 358) to 99% (McKinlay, 1980, p. 361) of the users reported that the CACGS was "fun to use." For high school students, parents were also happy with the results and a CIS study found that 64% of the parents contacted had discussed the printout with their children (McKinlay, 1980, p. 360).

Time Saving

Computers are not as flexible as humans and can perform only those functions for which they are programmed. For all special needs, and for personal insight into self-defeating behaviors, there is currently no substitute for the human counselor. CACGS do not lessen the need for a career technician, but stimulate traffic in the career library and add to the reputation of the career library for providing meaningful information. Computerized systems facilitate the information-gathering process and improve the service by providing printed copies of the most basic career information while whetting the client's appetite for more details. If highly volatile data like wages and outlook are provided by the CACGS, the more stable, detailed descriptions of the job duties can be provided by other resources and career information technicians will have more time for addressing highly specialized individual needs.

So CACGS add to the current career counseling program, instill a bit of sparkle and glamor into the process, and increase the interest in career planning. But they do not replace or lessen the need for existing services.

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Chapter Three

EVALUATION CRITERIA FOR COMPARING COMPUTER-ASSISTED CAREER GUIDANCE SYSTEMS

New computer-assisted career guidance systems (CACGS) enter the market almost every year. It is easy to be impressed by the first CACGS one sees, but a great deal of sophistication and keen analysis are needed to choose wisely from among them. Is the CACGS which has the largest number of titles better than the one which has more information on each topic? Is it better to use the most sophisticated equipment, or to keep it as simple as possible? Which CACGS will your clients or students find easiest to use and understand? What are the hidden problems which will appear after purchasing a system?

This chapter uses the terminology and issues introduced in Chapter Two to provide an evaluative framework which you can use when selecting a CACGS. A summary of this process is found in Appendix C. The following four chapters apply these criteria to four specific systems currently available. These systems illustrate a variety of ways of dealing with the issues raised here, but you

must make your own decisions as to the relative effectiveness of each system in your setting.

Needs Survey

Before looking at CACGS, it is useful to construct a model of the ideal CACGS for your site. Survey the counselors, career technicians, teachers, advisors, and anyone who will be using the CACGS. Ask them what, ideally, they would like the system to do. You may want to have a brainstorming session during which everyone's wishes are listed without evaluation. When everyone's ideas have been expressed, group consensus can be sought for establishing priorities.

Of special importance are the features which are most difficult to provide without a computer. To distinguish among these, it is necessary to list both content and process items. For example, every career library has information about occupations. But CACGS provide copies for the clients containing the specific information requested by them. For the client, the emotional impact of using a CACGS is very different from looking up the information in a career library.

Often the "wish list" will include components which are impossible to achieve at a reasonable cost. At this point it is not necessary to be realistic. But carefully prioritizing the principles and values which your site desires in a CACGS can provide valuable guidance in narrowing the choices to a few systems which can be evaluated thoroughly. The following issues should be addressed when prioritizing your list.

I. SYSTEM GOALS

Each CACGS is based on a theory of career development and a philosophical orientation to career guidance which determine its structure and its area of maximum impact. However, this value structure is often not fully verbalized and must be discerned by reading between the lines in the promotional literature and noting the "personality" of the system. In order to choose among

CACGS, you must take a hard look at the reasons for including or excluding various components, the cost-effectiveness of each component, and the long-range impact of each on your client population.

Philosophy

There are certain features which are found in all CACGS. These commonalities are partially determined by the capabilities of computers and availability of materials. Since computers are especially good for information retrieval and sorting, each major CACGS includes an access strategy for sorting occupations as well as vast information files divided into small, meaningful units for ease of use. The differences, however, are based on the philosophies of their authors. Those who believe accurate information is the key to wise decision-making may have chosen their data base carefully and devoted a great deal of attention to data collection. Those who have a counseling and teaching background have created extensive didactic modules to explain the world of work. And those with a theoretical background teach rational decision-making theory.

Looking back at the career planning process which was summarized in Table 1 (Chapter One), you will notice that some of the steps in this process are ill-suited to computerization. Step I, Personal Review, and Step V, Implementation, fall into this category. Taking a personal history from a client and looking for common threads running through it is very difficult for a computer, as is following up with emotional support while the client implements the plan. However, Step II, Assessment, and Step IV, Planning, could be computerized if desired. Step III, Decision Making, is well suited to computerization, especially the functions of identifying options and gathering information. So simple CACGS will deal with identifying options and gathering information while more sophisticated systems will cover additional steps on either side of this step.

Objectives

Most CACGS state their objectives very clearly in the promotional literature. It is useful to match these objectives with those of your institution or agency. It is exciting to note that each of the CACGS reviewed here meets its objectives and, in most cases, extensive research has been conducted to substantiate its value to clients.

In addition to specific learning goals, each CACGS was designed with a specific population in mind. Most CACGS are also effective with other people and will be found in a variety of agencies and institutions. Knowing which population the CACGS was designed to serve will provide insight into its personality, but should not be used as a discriminating factor.

Limitations

It is an easy project to determine which components are found or not found in each CACGS. It is a bit more difficult to determine limitations in the quality or breadth of each component. One easy way to gather this information is to ask the system's competitors. Although their answers will be biased, they will give you many useful insights into the system's weaknesses. You can then assess the significance of their criticism to your setting.

II. DIDACTIC COMPONENTS

Topics

Three types of components are found in CACGS: didactic, assessment, and informational components. Didactic components are designed to teach a concept or process. There are a variety of topics which could be included in a CACGS. The CACGS might attempt to explain the career planning process, the values clarification process, how to make rational decisions, the structure of the world of work, how to use information resources, or how to obtain financial aid, among other topics.

Presentation

One technique for teaching these concepts is to arrange didactic sections in consecutive displays which read like a book. Sometimes these are easy

to skip by pushing the same key each time the client wishes to continue. At other times the continuation signal will vary so the entire screen must be read before continuing. Either way, this technique assumes that every client needs all of the information provided. Alternatively, a list of topics may be offered, either on the computer or in a user handbook, and the client can ask for the information desired. Programmed learning, a third technique, asks a question to test the client's knowledge and then offers different types of learning experiences, depending on the client's response. This type of didactic material is much more difficult to develop, but much more flexible and interesting for the client.

Interactivity

Assessing the degree of interaction between the client and the CACGS requires a bit of sophistication. At first glance clients appear to be typing responses and receiving information at about the same rate for each CACGS. On closer inspection, some CACGS respond uniquely to each client while others give the same response no matter what the client does. Perhaps the ideal CACGS would carry on a true dialogue with the client, allowing the client to change the topic or backtrack at will. To approach this ideal some CACGS rely heavily on a menu or on key words which are explained in a user handbook. Another way to approach a dialogue is to use programmed learning techniques well, so that for each task, the client's level of achievement or understanding determines the next task or explanation presented. Only a few CACGS contain this level of interactivity.

Relevance

Most of the didactic material in each of the CACGS listed here is relevant and effective with certain populations, but you will want to assess its relevance to your clients. Sometimes it is necessary to try it with a few clients to accurately determine its relevance. If there are irrelevant segments, are they easy to skip?

Reading Level

Most of the CACGS reviewed here are written at

the sixth to ninth grade reading levels. They are written as simply as possible, considering the complexity of the material. Often exact reading level information is difficult to obtain from the system staff since reading level analysis is costly and results vary with the method of analysis which is chosen. Some CACGS come in two versions, one which is written very simply for young people and one which assumes a bit more sophistication for adults. In most settings, the reading level is not as important as the clarity of the instructions. Those CACGS which have a close relationship with their users may continually revise the instructions until they are clear to most users.

III. ASSESSMENT COMPONENTS

Topics

All CACGS have at least one access strategy which sorts out relevant occupations, but there is a great deal of variety in the topics used for sorting. Some CACGS have chosen those topics for which the most accurate data is available. Others have chosen those topics which counselors find most relevant. Others use topics on which clients tend to have strong opinions for ease of use without assistance. Access strategies are currently available which sort occupations by aptitudes, abilities, skills, interests, worker traits or job characteristics, values, or personality types. Each of these ways of sorting occupations gives different results, so the client could have seven different lists if each of these topics is used separately. There is little evidence that one set of topics has more predictive validity than another.

It is possible to select a CACGS which complements your current assessment methods or one which reinforces them. Since each of the above topics will produce a meaningful list for some clients, you may wish to have as many options available as possible. In this case, the CACGS should perform a service not already offered by your current assessment tools. On the other hand,

you may be looking for a coherent package and choose the system which utilizes the topics covered in the counseling process. Or you may want a CACGS which will pull them all together for the client.

It is important to select a CACGS containing those topics with which your counselors feel comfortable. Facilitators at your site will spend a significant amount of time supporting, clarifying, or interpreting the items included in the CACGS's assessment module. If they value these items, their feelings about the CACGS will be more positive and their relationship to the CACGS will be closer.

Self-assessment Aids

Some access strategies, like those used in CIS and GIS, are basically questionnaires which assume that the client has sufficient self-knowledge to answer the questions fairly accurately. Others, like SIGI and DISCOVER, provide on-line assistance in this self-assessment process. Since most clients need assistance with self-assessment, you must decide whether it is more cost effective to use computer time to provide this assistance or to offer counseling or a class to aid in this process. If the CACGS is simply asking the same questions on-line which could be asked by a paper-and-pencil inventory, this service is probably not cost effective.

Data Base

Another important aspect of the access strategy is the data base which relates the assessment topics to the occupations. The most comprehensive and carefully researched data base available in the United States is the *Data Display* produced by the U.S. Department of Labor. Department of Labor research centers gathered this information by observing workers in each occupation listed in the *Dictionary of Occupational Titles*. These centers provided comparative data on approximately 45 topics. If these topics are selected for use in the access strategy, the relationship between the occupations and the access strategy is clearly empirical. Topics not included in the *Data Display*

are usually related to occupations by a panel of "experts" or a compilation of available research. Conducting original research for this purpose is very costly and therefore quite rare. It is not possible to accurately judge the accuracy of the data by using the system for a short time, so it is important to determine the source of the data and to request statistical evidence which indicates the validity of the instrument.

Logic

The logic of the access strategy also has a strong impact on the user. Some systems use complex formal logical structures. Others use simple inclusion or exclusion. Still others use a goodness-of-fit measure. The structure should be easy to understand so that users can readily see the effect of changing their answers, but should not be so simplistic that a false picture of the world of work is created. This balance is very difficult to achieve and most CACGS fall short in some respect.

Relevance

The items in the access strategy should be relevant to your clients. If the questions asked are meaningful to the clients and are important issues in their decision making process, the self-assessment process will seem more valuable and their appreciation of the CACGS will be greater.

Interactivity

The comments about interactivity of the didactic components also apply to the assessment components. In some systems, clients must respond to a long list of questions. Their answers are then scored and the results are reported. This on-line administration of a paper-and-pencil test does not fully utilize the power of the computer. Truly interactive systems allow the user to change any response, and each change makes a noticeable difference in the results. This type of interaction is highly instructive for the user by dramatizing the effect of each choice and is not available through any other medium.

The logic and instructions should be easy to understand without decreasing the level of interactivity or oversimplifying the trade-offs in occupa-

tional or educational selection. This is very difficult to achieve. Some systems give very little control to the user, presenting all of the assessment items to all of the users. Other CACGS offer a high degree of interactivity by explaining all the options in detail. Other CACGS incorporate more sophisticated logic and assume that the user can deal with it effectively. The ideal CACGS offers a great deal of freedom of response while being easy for the novice to use without reading lengthy instructions.

Reading Level

Reading level is even more problematical for the assessment components than for the didactic components. Since the assessment topics often include fairly complex concepts, lowering the reading level by simplifying the words is not advantageous. Instead, the CACGS should provide sufficient assistance in self-assessment or audio-visual aids to raise the comprehension of the user to the necessary level.

IV. INFORMATIONAL COMPONENTS

Topics

One of the easiest ways to compare CACGS is to determine the types of files each one has. All of the major CACGS contain descriptions of occupations which include duties and entry requirements. Salary and outlook information is usually included, though this information must be continually updated to be useful. Many CACGS also describe educational opportunities. They may describe educational programs and/or list the schools which offer each program. Since lists of schools must be updated annually, each CACGS must clearly define which schools are or are not included.

A variety of other types of information is included in various CACGS. Most CACGS include bibliographic information to provide users with an easy transition to written materials commonly included in career libraries. Some CACGS include job search modules, but the content of these modules varies widely. Other CACGS contain

military files or files for special populations such as the disabled or women. Some CACGS contain academic program planning modules or articulation modules which can be implemented and maintained by the user site. The value and relevance of these files depends on the needs of your user group.

It is much more difficult to evaluate the accuracy of the information files. To make a careful comparison, select a variety of occupations and, if desired, a variety of educational programs and obtain comparative printouts for each. For sites serving a broad user group, select at least one of each of the following types of occupations: seasonal semiskilled, clerical, apprenticeable, licensed or credentialed, and professional. A similar variety of levels of education can also be selected. By comparing several printouts in each category, it is possible to balance the occasional errors, omissions, or obsolete inclusions which occur in every system and to observe the unique strengths of each system.

Degree of Detail

It is important to assess the degree of detail in the informational components. Most CACGS are bound by space constraints since computer storage is expensive. Users also lose patience with long printouts. Some systems offer large numbers of occupations or educational programs with short descriptions of each. Others offer more comprehensive descriptions but include fewer categories. Under educational programs, some list only the names of schools, while others list the name of the major and course requirements under each school.

Reading Level

Assessing reading level is difficult for the informational components because some CACGS use different reading levels for occupations requiring different levels of education. Although it may be difficult to determine how well your clients would be able to understand the information without a trial period, the differences should be noticeable if comparable printouts are obtained. It

is also useful to review the titles of occupations or educational programs included in the CACGS to determine the target population for the system.

Accuracy

A major concern in reviewing content is accuracy. In order to remain accurate, information must be updated regularly. Salary and outlook data is especially perishable, as are lists of schools which offer educational programs. Other types of information, such as occupational duties and entry requirements, and educational program descriptions, change less frequently. Some CACGS are bought by the user site and updates for the perishable data are optional. Other CACGS charge a lease or subscription fee and update the data at regular intervals. If you are concerned with accuracy, yearly updates are essential.

Localization

Another aspect of accuracy can be judged by observing the degree of localization of the data. Some CACGS provide national data and permit sites to add their own local data. Others provide statewide data, while others provide data for regions within a state. By obtaining printouts of a variety of occupations and educational programs, you will be able to determine the value of localized data to your users. Special attention to details such as licensing requirements or local educational programs will reveal important differences between CACGS.

If developing your own information is an option, determine the true cost of the task. Most CACGS will be able to provide you with realistic estimates of costs for the initial information development and for continuing information maintenance. The annual cost of maintaining the information is usually only slightly less than the cost of initiating the process so you will need a secure, long-term funding source for this project.

Data Sources

Most CACGS do not conduct original research. You will often find their data sources in your career library. A list of these sources should be provided on request and a careful analysis will help

you to assess the value of computerized information over the information in the career library.

Interpretation

Of course, each CACGS combines available information in a unique way by interpreting and evaluating the meaning of this data. Although subtle, the impact of the philosophy of the system will be observable by comparing descriptions of new and developing occupations. Outlook statements, salaries, and optional information categories will be especially enlightening.

V. INTERNAL STRUCTURE

After looking carefully at each component of the CACGS, it is important to view the system as a whole. In the presence of an expert demonstrator, any system looks easy to use. But few sites can afford to have a facilitator sit at the terminal with every user. How easy is the system to use for the average client you serve? What must the user know before beginning? What decisions must the user make while at the terminal? Since use of a computer may be anxiety producing, situations which require recall or decision-making at the terminal may be more difficult than usual for clients.

Cross-Referencing

Some CACGS include a great deal of cross-referencing. This allows users to switch easily from one component to another and increases the probability that they will find what they are looking for.

On-line Instructions

Some systems have lengthy on-line instructions. Others put the instructions in a user handbook so that clients will need little instruction from the terminal.

Flexibility

Some CACGS encourage users to control the interaction by switching between components as desired. Others do not allow switching around, assuming that career decision-making is an orderly process.

Complexity

Some CACGS simply offer information which may be requested in any order. Others are much more complex in an attempt to manage the progress of the client.

It is difficult to judge the value of each of these

features to your clients. Facilitators often have different needs and values from those of clients, and an exercise which is exciting for you may be a source of frustration or anxiety for a client. Listening carefully to the needs of the career technician or aides is also important, since they will have constant contact with the system and the smallest of frustrations will be multiplied by the number of users they see each day.

Type of Use

CACGS vary greatly in their intended type of use. Some store the user's name and answers so that users may break their experience into several sessions and begin each time where they ended the last time. Other CACGS have no memory but allow quick access to any component so that repeated usage is encouraged, though not necessarily expected. Some CACGS have all instructions on-line so that users begin with little preparation. Others keep on-line time at a minimum to reduce costs, and the computer is used only to process answers and/or provide information. For each of these options there are advantages and disadvantages. You must weigh their value with respect to your clients, counseling program, and funds available.

VI. SYSTEM MANAGEMENT

Supporting Materials

The accessory materials for each system vary greatly. Some CACGS rely on user handbooks while others provide charts or lists for reference beside the terminal. Some have filmstrips or movies for use in preparing users. But all systems should have a good counselor's manual which allows new staff to learn to use the system without extensive in-service training.

Some CACGS also have materials which replace the computer for sites which cannot afford a computerized system. A simply designed access strategy can be placed on needle-sort cards or on transparencies. Or a microcomputer can perform the sorting operations. The data files can be

printed in books or on microfiche. These materials can be very useful in settings where it is not convenient to let individual clients sit at a computer terminal as long as they like.

Service

Many systems also offer in-service training for new sites. This training is very expensive and the results are intangible, but due to the complexity of a CACGS, these training sessions usually are very valuable. At some sites a "computer buff" will learn the system by trial-and-error and offer to train other site staff. A professional counselor or trainer with experience in using the system in a counseling setting can provide much better training by explaining the counseling implications of the system and emphasizing the uses of the system which have proven most effective.

Many systems have active member associations which meet regularly to discuss problems and suggest desired changes. Attending one of these meetings provides an important insight into the system and its responsiveness to your needs. These meetings may also provide a useful opportunity to check on the reliability of the system. Are data tapes usually provided on schedule? Is the information updated as carefully as promised? Is the system well managed? Facilitators at sites which already use the system can provide useful insights into these questions.

Evaluation

Most CACGS have been studied and evaluated by numerous agencies, and will provide a bibliography on request. Many systems also collect their own data on system usage. Some CACGS collect data about their usage automatically. These statistics provide useful objective data about average on-line time per user, most frequent responses, and data files which are most frequently used. Other CACGS ask each site to give questionnaires to users to obtain subjective data. Do users feel the system was valuable to them? Which parts did they like best? Were the instructions easy to understand? Copies of these evalua-

tions are usually available on request.

IV. HARDWARE REQUIREMENTS

In studying CACGS it is necessary to learn a new vocabulary of technical terminology and communicate your concerns to computer programmers who may have little understanding of the counseling process. Because the communication styles of counselors and programmers are so different, misunderstandings are common. Chapter Two introduced many of these terms and the glossary in the back of this manual may provide further assistance.

Computers

Does the CACGS of your choice run on one of the computers available to you? If not, you face a very difficult decision. Programmers often underestimate the cost and difficulty of converting a CACGS for a different computer. Even the simplest conversion will cost a couple thousand dollars and a month of *full time* programming. If unexpected difficulties arise, as they usually do, the cost and time can easily double or triple. Once converted, the CACGS will run smoothly until an update is issued. At that point you may need to hire another programmer, unless the CACGS staff agrees to provide continuing support for the new version.

Terminals

To decide which terminal to use, ask a representative of the CACGS you select. Each CACGS was designed with a specific type of terminal in mind and you will be much more satisfied with the service given by the standard type of terminal. Once you have chosen a terminal, any computer person can help you choose a transmission mode and the accompanying hardware.

If you choose a CACGS which runs on a microcomputer, your hardware choices will be much simpler. It is important to buy the type of computer on which the CACGS has been designed to run. The CACGS representative can tell you exactly what you need for the system and may be

able to sell you the hardware.

Dependability

Unfortunately, computers break down occasionally. Older computers or very new computers tend to break down more frequently. Checking the reputation of the computer before subscribing to the service is helpful.

Computers also vary in their ease of access and use. Some computers offer capabilities which increase the flexibility of the CACGS. Others simplify the log-on process so that it is easy to get started each time a new user begins, but most require a careful, exacting log-on procedure. When facilitators are under pressure or dislike machines, this procedure becomes a difficult task.

The terminal can also fail. A technical expert (or knowledgeable amateur) nearby is very helpful. The less sophisticated equipment has less that can go wrong, so problems can be avoided by keeping the equipment simple. But the most valuable technique for avoiding frustration is to schedule the clients' use of the CACGS in such a way that a mechanical failure is not overly disruptive. Sites which cannot allow time for rescheduling clients when the computer is malfunctioning may wish to consider the CACGS an optional component of the program.

Cost

Once the hardware has been identified it is possible to determine the cost of using the CACGS at your site. To compare costs of running several CACGS, duplicate this chart:

	Purchase Price	Yearly Fee	Per User Cost
Terminal rental or purchase			
Terminal maintenance			
Paper and ribbons for printer			
Telephone charges			
Computer services charges			
CACGS purchase, lease, or subscription fee			
Staff time			
Total			

Each of these costs depends on the CACGS chosen. For example, a CACGS that requires four hours per client will require twelve times the terminal capacity, telephone time, and computer time as a CACGS which requires 20 minutes per client. The costs also depend on the configuration at your site. Charges for serving one terminal on your own computer are very different from the charges for using a remote computer which also serves several other sites.

The numbers can be filled in to calculate the per-client cost for each CACGS. First determine a maximum and minimum number of users, since the anticipated usage is rarely achieved. The maximum number of users is the number of clients which could benefit from the CACGS, provided the hardware can accommodate that number. The minimum is approximately one-tenth of the maximum. Place the cost of the terminal in the Purchase Price column if you plan to buy the terminal and in the Yearly Fee column if you plan to rent.

Terminals can be rented if you are using grant funding. However, the rental fees for about eighteen months will equal the purchase price, and terminals usually survive 5 to 10 years. If you purchase the terminal, be sure to budget for maintenance. Heavily used terminals will need repair at least once a year.

To determine the number of terminals needed, ask the CACGS representative how long each client will use the terminal. Estimate the number of hours the terminal will be available for use per year at your site and divide by the number of hours each client needs at the terminal. The result will be the maximum number of clients which could be served by one terminal. Be sure to budget for enough terminals to serve the maximum number of users.

Some terminals require ribbons and paper. The CACGS representative can help you to estimate

the cost of these. Enter these costs in the Yearly Fee column.

If the computer is more than one block away, you will need a telephone line to communicate with it. If the computer is within the local calling area, the cost may be a flat monthly business telephone fee. If you install a private data line, the charge will also be a flat monthly fee. But, if you must pay message units or long distance charges, the cost will be based on the number of minutes each client uses the CACGS. In this case you will have both a yearly fee and a per user cost for telephone service.

Some computer centers arrange a flat monthly fee. Others charge according to actual usage, which includes a minimum fee for having the program on the computer and a usage fee which can be averaged to a per-user cost. The CACGS fee will be either a purchase price or a yearly fee. Staff time will depend on the amount of assistance needed by users of the CACGS and should be calculated as a per user cost.

Divide the Purchase Price total by three, a realistic number of years for using the same equipment. Add this to the Yearly Fee total. Divide by the maximum and minimum number of users, respectively. Add the Per User total to each quotient. This is your cost range for the CACGS. The formula looks like this:

$$\frac{\frac{\text{Purchase Price}}{3} + \text{Yearly Fee}}{\text{Maximum Number of Clients}} + \text{Per User Costs} = \text{Minimum Per Client Cost}$$

$$\frac{\frac{\text{Purchase Price}}{3} + \text{Yearly Fee}}{\text{Minimum Number of Clients}} + \text{Per User Costs} = \text{Maximum Per Client Cost}$$

Although this cost formula is complex and the calculations are time consuming, the results are *very* enlightening. It is well worth the time if you wish to make a wise choice.

Summary

This chapter has described a number of issues which you may want to keep in mind as you explore a CACGS for your agency or institution. Chapters Four through Eight contain descriptions of four CACGS using these evaluation criteria, and the margin notes used in this chapter are repeated for ease of comparison and cross-referencing. Each CACGS reviewed was selected to illustrate a different philosophy and there are several other excellent CACGS which are not included here.

Before you read each of the next four chapters, it would be helpful to request system literature and a demonstration since these chapters are comparative and may not provide a comprehensive overview of each system. When you are ready to select a CACGS, it is important to gather current information since CACGS change rapidly and some of the information here may be out of date. These chapters are intended to provide a basis for asking knowledgeable questions and will illustrate the evaluation process. However, to avoid prejudicing prospective customers, many controversial issues have been dealt with gently. Talking with sites using each system will help you to evaluate the importance of these issues in your own setting.

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Career Information System

Chapter Four

ANALYSIS OF THE CAREER INFORMATION SYSTEM

Work on the Career Information System (CIS) began in Oregon in 1969 under a grant from the Department of Labor and CIS has been the Oregon state system since that time. The project director, Dr. Bruce McKinlay, had experience in public school teaching and occupational research. His goal was to design and test a system that would provide accurate, locally-relevant career information to the wide variety of people who make personal career decisions. The design team included experts in counseling psychology and labor market information as well as practicing counselors from a high school, a university, the Employment Service, and Vocational Rehabilitation. Educational components were added in 1974 as the result of a joint project of the Career Information System and the State System of Higher Education in Oregon, with funding from the Fund for the Improvement of Post-Secondary Education and the CIS Consortium. Refinements (including a complete revision of QUEST in 1978) and enhance-

ments (such as the addition of nationwide college information in 1982) continue the development of CIS.

Because CIS emphasizes local information and insists that counselors, teachers, librarians, and others who use the system with clients receive adequate training, CIS is not marketed directly to schools and agencies nationally. Instead, National CIS, a separate organization created to coordinate the development of CIS on a national level, provides software, research methods, and training to statewide or regional organizations that want to develop their own local information and train staffs at their own local user sites.

All of the 17 states or regions which have now adopted CIS (called operators) have changed it slightly. One of CIS's advantages is the ease with which it can be adapted to meet the needs of the local area. If you state or region has adopted CIS, most of the description which follows will apply to the local system. However, you will notice that the local CIS differs in some ways which reflect local conditions or the inspiration of local leaders.

I. SYSTEM GOALS

"In a nutshell, the goal of CIS is to put current, local, accurate, comprehensible information into the hands of individuals who need it for their own planning purposes." (McKinlay, 1977, p.124) This task is seen as having three components: (1) information, (2) delivery, (3) assistance. Information is compiled from government and private data programs and verified or supplemented from original sources. Information is reported from a career planner's perspective, in terms and with comparisons most meaningful to that audience. Delivery refers to the computer programs which make this information easy to access. Assistance includes the training, manuals, technical advice, and other support which is given to user sites and facilitators.

Philosophy

According to Dr. McKinlay,

Without depreciating the truly great service provided by the Occupational Outlook Handbook *or the great sensitivity of some counselors for the meaning of labor market events, one can fairly generalize by saying that people making career decisions do not have ready access to the many valuable studies of the Bureau of Labor Statistics, the National Center for Educational Statistics, the Research and Statistics offices of the state employment agencies, licensing boards, educational planning agencies, research centers, trade associations, or all the other places where useful information is produced. The professional researcher, and sometimes the program planner finds it and can comprehend it, but the career decision-maker neither finds it nor comprehends it in its raw form. We are now coming to realize that delivery is necessary to the effective utilization of research.*

We are also getting over the naive notion that social problems are solved simply by sending counselors forth to do good. Like other practitioners, they need tools and other support systems. Clearly a career information system is in this realm. Individual counselors are not expected to construct, validate, and standardize their own tests, and they should not be expected to collect, analyze, and store their own labor market information. (McKinlay, 1975, p.253)

The CIS philosophy begins with the observation that information (along with self-understanding, awareness of options, decision-making skills, and support services) is one of the essential ingredients of any sound career development process. Quality information is information that is accurate, relevant (to the individual and to the area where he or she will work or go to school) and easily accessible. Just as important, the information must be used. Thus the CIS philosophy includes a heavy emphasis on user-oriented software and materials, low costs, and integration of CIS into the

counseling and instructional programs of the institutions that use it. CIS believes that a good information system will neither burden nor replace professional staff; it will enable them to serve more people (by letting some people answer factual questions for themselves) and enhance their counseling and teaching (by providing easy access to impartial information when it is needed).

Objectives

The population which CIS intends to address are people making personal occupational or educational decisions, wherever they are found. CIS is used widely in rehabilitation agencies, employment and training programs, schools, colleges, and prisons.

CIS has seven objectives:

- To interface with the traditional guidance function;
- To be effective in the delivery of occupational and educational information;
- To be client-operated;
- To use the structure, order, and format of the access strategy (QUEST) and information files to optimize successful individual information searches;
- To make an impact on those who use CIS;
- To be useful to a wide variety of people;
- To be attractive to career planners.

Research on the use of CIS demonstrates that all of these objectives are met. (McKinlay, 1980)

Limitations

CIS does not attempt to provide guidance, although the access strategies called QUEST and SELECT do provide objective feedback to clients on the requirements of their favorite occupations and suggest occupations which are consistent with the client's stated occupational preference. CIS does not have a component to interpret these results for the client, leaving that for the client and counselor. The CIS philosophy is reflected throughout the system, but is not explicitly explained to the client.

II. DIDACTIC COMPONENTS

No explicit structure for didactic modules has been built into CIS software. Instructions for using CIS are found in the CIS *Users' Handbook*. However, there is a subtle, didactic effect resulting from the structure of the system. Unlike GIS, which has a purely logical structure, CIS has a structure which incorporates labor market concepts and educational system organization. The client learns this structure and becomes aware of these concepts through the use of the system.

Some CIS operators (local CIS systems) have added didactic material in special files, such as a Terminology File or a Job Search File. Since CIS specializes in information which can be used in a variety of developmental activities, the career planning process is not expressly taught as a process. Clients need to have some objectives in mind before using CIS and should see a counselor after using CIS to integrate the information into their future plans.

III. ASSESSMENT COMPONENTS

Topics

CIS does not provide on-line assessment. CIS software does contain an access strategy for finding relevant information, called QUEST (and its companion SELECT) and enters the career planning process at the point of selecting options (Decision Making, Step III, Chapter One). QUEST contains 21 questions. The first eight questions deal with temperaments related to work preferences and can be answered with yes, no, or not sure. The next eight questions deal with abilities and can be answered with high, medium, low or not sure. The user is asked to report the amount of each ability he/she wants to use on the job. The rest of the questions deal with strategic job characteristics such as educational level, geographic location, and salary.

Self-Assessment Aids

The user is expected to complete QUEST before

using the computer so CIS provides a *User's Handbook* which contains QUEST. Various exercises and audio-visual aids are available to help users clarify their preferences. Many sites provide individual counseling or group work prior to using QUEST and QUEST encourages users to inquire why favored occupations were left off the list and to experiment with different answers to see the effects of different choices.

Data Base

The first sixteen QUEST items are based on occupational analysis factors researched by the Department of Labor and this data source is used for determining the occupational matches for each item. Occupational analysis items which are included in QUEST were chosen experimentally and are the ones on which clients can most easily and accurately self-assess. The data for the other QUEST items, such as Beginning Wage and Educational Level, are based on the information contained in the local CIS data files. Each CIS operator is responsible for compiling this information and determining the occupational matches for these QUEST items.

Logic

QUEST uses an inclusive sorting process, and the process of elimination. All occupations are included on the user's initial list, and remain on the list until the user rejects an attribute required by that occupation. After perusing the initial QUEST list, the user is encouraged to change answers and obtain other lists. Since each change causes occupations to be added or removed, the user can clearly see the relationship between his/her answers and the occupations on the list. QUEST is easy to use, but some clients need a little encouragement to experiment with changing their answers.

Relevance

QUEST includes a wide variety of items and all items relate to specific, observable aspects of each occupation. The first sixteen items were designed by the Department of Labor using factor analysis and are intended to distinguish among jobs for

unemployment insurance purposes. If you currently use the GATB (General Aptitude Test Battery) or similar aptitude tests, QUEST will provide an excellent tool for relating these results to occupational choices. If you currently use interest inventories or personality assessment instruments, QUEST may produce very different results and the contrast may be useful.

Interactivity

QUEST uses interactivity moderately well. Although users typically enter all 21 answers before obtaining a list of occupations, users may request lists or change answers at any time. With SELECT they may answer any questions in any order. After they obtain the first list, users are encouraged to change answers to obtain alternative lists. The interactive process of changing answers and obtaining new lists is highly instructive for users and illustrates the power they have to change their lives by the choices they make.

Reading Level

QUEST was designed for use by people from the seventh grade through adulthood, and a recent readability analysis rates it between seventh and eighth grade (McKinlay, unpublished). Because of the complexity of the concepts and the varied audiences for CIS, audio-visual aids are more helpful in conveying the concepts than lowering the reading level of the written words.

IV. INFORMATIONAL COMPONENTS

Topics

All CIS systems contain at least three types of occupational information: occupational descriptions, preparation statements, and bibliographies for each occupation. Several optional files have been developed by individual states. Besides those listed in Table 2 for the Oregon CIS, one state lists local industries, another contains interviews with women in non-traditional occupations, and another contains interviews with the disabled working in various occupations.

Educational information is contained in three files: the Program File describes the educational

CIS OCCUPATIONAL INFORMATION

ATTR—The Attribute File lists the QUEST responses which are acceptable for each occupation. These occupational characteristics provide objective, comparative data about the occupation.
DESC—The Description File contains the following information for each occupation: Description of Duties, Aptitudes, Work Setting, Hiring Practices, Current Employment, Wages, and Outlook.
PREP—The Preparation File explains how to prepare for each occupation, including: Skills, Licensing, Preparation, and Tips.
BIB—The Bibliography File lists publications for further exploration and research.
EMPL—The employment file aids clients in their search for jobs including how to write a resume, where to find job listings, how to use employment agencies, etc.
VISIT—The Visit File lists names, addresses, and phone numbers of people working in each occupation who are willing to discuss their work with career seekers.
CLUBS—The Clubs File lists clubs which offer career experience programs in each region of the state.

CIS EDUCATIONAL INFORMATION

PROG—The Program File contains descriptions of programs of study and lists of the schools which offer those programs.
SCH—The School File contains information about post-secondary educational institutions in Oregon on over 60 topics. Up to three schools can be printed simultaneously in side-by-side columns.
NSCH—The National School File functions the same way the School File functions. It lists 1700 four year colleges throughout the U.S. and the data is collected by ACT and NCES.
FINAID—The Financial Aid File calculates the amount of aid students can expect from various aid sources while attending each of the schools in the School File.

Note: These files are found in the Oregon CIS. Most CIS's contain DESC, PREP, BIB, PROG, and SCH. Other files are optional. Contents of all files can be modified to meet local needs.

Table 2.

program and courses usually required, then lists schools which offer that program; the School File contains information about specific colleges and trade schools; and the Financial Aid File assists clients in evaluating their eligibility for financial aid for each college they wish to attend. These files contain information primarily for schools in the state or region in which the system operates.

Other files can be developed by local CIS operators or through cooperation with National CIS. For example, Alaska recently implemented a Planning File containing more detailed occupational information needed for planning job training programs. Other states have joined together to add national college information similar to the current School File and Program File and to add a college search strategy.

All information must be localized and maintained by the region using the system. Although basic occupational and educational program descriptions are provided by National CIS when the system is adopted, each state is encouraged to revise the information to reflect local conditions and is free to add occupations or educational programs with special local relevance.

Degree of Detail

Each CIS contains between 250 and 550 occupational descriptions. Each description includes local working conditions, wages, and entry requirements. Emphasis is placed on accurate, detailed information and CIS provides training in labor market analysis to new systems and new staff.

Reading Level

The reading level of the occupation usually varies according to the level of education required by that occupation. Some states have conducted special projects to revise the descriptions to lower the reading levels.

Accuracy and Localization

Update schedules vary from daily to twice per year, depending on the system's policies. All occupational descriptions are written by a CIS operator to describe local conditions. Some sections of the description (pay, outlook, and number

employed) may be further localized to regions within a state.

Data Sources and Interpretation

Data is collected from Department of Labor publications, state employment security departments, wage and salary surveys, and workers, employers, unions and others in each occupation. Each system maintains an information development staff which collects and interprets the data. Many CIS's work closely with the state employment security agency for information development and use similar guidelines for interpreting the information.

Educational information is produced on the same update schedule, but organized and gathered quite differently. There are 130 program clusters in CIS. The lists of schools offering each program include the actual degree title and may include the courses required at each school. This information is verified by each educational institution. The School File includes a wide variety of topics selected to serve high school students, reentry adults and minorities. The information is gathered annually by questionnaires sent to each school. These files include schools within the state or region and selected other institutions.

Some CIS's now also have a National School File. The sources of information for this file are the American College Testing Corporation and the National Center for Educational Statistics which collect the data using questionnaires.

V. INTERNAL STRUCTURE

Cross-referencing

Each CIS file is widely cross-referenced to other files. Occupational files contain cross-referencing both to other occupations and to programs of study. Programs are cross-referenced to other programs and, in some CIS's, referenced back to occupations. The Program File also contains School File numbers for ease of movement in that direction.

On-Line Instructions

Instructions are contained both in a CIS *User's*

Handbook and on the computer. Users are expected to read the *Handbook* before using the terminal, but system prompts help them to remember the instructions and move in an organized path through the system. The instructions are brief and most people who read them can follow them without assistance.

Flexibility

The system encourages flexibility by using key words. Most of the key words are about four characters long and resemble meaningful words so they are easy to remember. Any key word can be used at any point to get the information or module requested.

Complexity

The level of complexity in CIS can be judged by noting the key words it uses (see Table 2). Users must command each type of information they need. Because they are in control, users can skip irrelevant material; thus it is also possible for them to skip valuable sections. Brief prompts encourage them to move systematically among system components and not to skip anything inadvertently. Occasional assistance by a facilitator is needed by those who can't grasp the logic or who misunderstand the instructions.

Type of Use

Statistical studies repeatedly indicate that the average on-line time is 30 minutes per use and up to one third of these users return to obtain further information in the same year. The system does not keep records of individual users. Users who choose to enter QUEST on a second visit must start over. The other modules do not need a memory since they contain only information. Information can be accessed directly by using a key word and a code number, so the system can be used very quickly for information retrieval.

VI. SYSTEM MANAGEMENT

Supporting Materials

The subscription fee for CIS includes user handbooks in quantities sufficient for every user to have one. Other materials, such as posters and instruction charts are often provided. A coun-

selor's implementation handbook is provided, containing dozens of activities that teach the structure and use of CIS, provide personal or group assessment activities, relate CIS to aptitude and interest measures, and provide instructional uses for CIS information. Various components of the computerized system and other career materials are used in these off-line Learning Activities. Some CIS's have developed filmstrips or slide shows to explain QUEST items to users and instruct them in the use of the system.

Many operators produce QUEST and the information files in supplemental forms for sites which do not have a computer. Needle-sort decks provide an alternative to the computerized QUEST and can be used for classroom demonstrations of the decision-making process. Microcomputer versions of QUEST are also used widely. Data files are usually available in book or microfiche form.

Service

In-service training is an essential part of CIS and is usually included in the subscription fee. Most CIS's maintain close ties with the sites and offer annual programs for supplemental training. Since CIS operators are local and have a great deal of autonomy, they tend to be quite responsive to suggestions for change.

The reliability of the data and the update distribution schedule vary with the operator. Systems which have been operating for a few years usually have a good reputation for meeting deadlines. The close contact with local critics encourages accuracy of data.

Evaluation

CIS contains an automatic statistics collection program. In addition, most operators perform annual evaluations. CIS has been thoroughly evaluated, both in Oregon (McKinlay, 1980) and in other states, and several CIS's have conducted extensive local research.

VII. SYSTEM REQUIREMENTS

Computers

Although versions of CIS are available on more

than ten types of computers, each state or region may maintain only a few of these versions. In some states CIS is provided on a statewide computer network. Others allow local sites to install it on their own computers. Contact your local CIS for a list of computers available to you.

Terminals

Time-shared CIS is intended for use on a hard-copy terminal. This means that an ordinary telephone can be used for data transmission if desired. Any terminal may be used which prints on paper and is compatible with the computer you are using. The microcomputer version uses a standard monitor with an optional printer.

Cost

The cost of CIS is relatively low because each user needs only about half an hour of terminal time and the equipment is relatively inexpensive. In some states CIS is subsidized by the state and the cost is minimal. In other states the entire cost is borne by the sites which use it. Compared to GIS and COIN, which are national systems, the cost may be higher since the data is maintained locally and the cost is divided only among sites in your state.

Many CIS's have a variable charge based on the number of users at each site. Unlike national systems, CIS's are usually run by consortia or affiliated with state or local governmental agencies, universities, or non-profit corporations. They often set fees which use the same formats that are used to apportion funds to public agencies. The bulk of these fees pay for updating the information, so charging according to the number of clients can be justified.

Since each user needs about half an hour of terminal time, at least 1500 clients can be served by one terminal in a school setting (6 hours per day, academic calendar). In high schools, one-half to two-thirds of the students use CIS each year. In colleges the percentage of users is lower (about one tenth at four-year colleges) and the time needed by each client is slightly higher (average of 45 minutes) (McKinlay, 1975).

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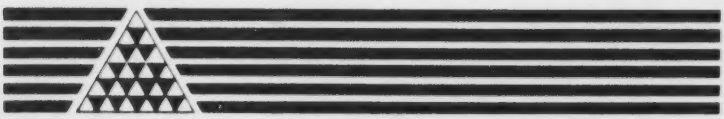
THE GUIDANCE INFORMATION SYSTEM™



Chapter Five

ANALYSIS OF THE GUIDANCE INFORMATION SYSTEM

The Guidance Information System (GIS) offers rapid access to six extensive information files describing occupations, the Armed Services occupations, two-year colleges, four-year colleges, graduate schools, and financial aids. Information may be requested directly or a file may be searched to find all relevant information. There are up to 900 ways of searching each file—this extensive array of options makes GIS one of the most flexible computer-assisted career guidance systems (CACGS) available. It is an excellent tool for quick access to concise information.

GIS is now used at more sites and runs on more makes of computers than any other CACGS. It was developed in 1971 and is marketed by Time Share Corporation (TSC), a subsidiary of Houghton Mifflin. It contains national-level data and can be used as it is or sites can add local information about occupations, vocational or technical schools, financial aids, local business and industry, apprenticeships, and services to the handicapped.

I. SYSTEM GOALS

Philosophy

The creators of GIS came from Dr. David Tiedman's project at Harvard which created a prototype CACGS, the Information System for Vocational Decisions (see Chapter One). Unlike its predecessor, GIS is the most streamlined of the CACGS. The major goal of GIS is to utilize the computer to make available relevant information with which career decision-making can take place. According to the GIS *Resource Kit*,

The concept of Career Education has been nationally advocated as a means of more adequately preparing people to cope with both career demands and choices. In the broadest sense, Career Education is a developmental process through which individuals can be helped to gain knowledge of themselves and the world of work and to learn the skills needed for effective planning and active participation in the greater society. Three of the key components of most Career Education programs focus on: increasing a person's self-awareness, increasing his/her understanding of lifestyles and career roles, and increasing his/her skill in decision-making and planning. Basic to each of these elements is the availability of sound information. Whether the information is about an individual's interests and abilities or about the potential job market for lawyers in 1985, it must be readily accessible, accurate, and up-to-date.

The intention of the Guidance Information System is not to provide a matching or placement service, but rather to close the communication gap between the facts and those who need to know them for effective decision-making. GIS is not meant to be the final or sole source of career information. Rather, it is a dynamic tool which will increase the value of other resources by suggesting a direction for further exploration based on the user's needs and interests. Because the computer is playing the role of "data disseminator," counselors are free to play the more

important role of "data interpreter" and to deal with the personal and academic concerns of their clients. (*Resource Kit*, 1981, p. 47.)

Objectives

GIS was designed to meet the needs of all career seekers. Its objectives are outlined in the *Resource Kit*:

1. To encourage users to organize their thinking about educational and vocational plans.

2. To present users with a wider array of alternatives than they might ordinarily consider.

3. To help users understand values through their weighing of various factors basic to making a decision.

4. To encourage a sense of personal agency or involvement in the decision-making process on the part of the user.

5. To allow users access to more nearly complete and up-to-date information than exists in most settings.

6. To increase user ability to differentiate among alternatives through developing understanding of category systems.

7. To allow users to explore many tentative alternative plans in a bias-free context.

8. To encourage further exploration of plans by suggesting specific alternatives for consideration.

9. To increase user awareness of the distinction between objective and subjective data and between logical and illogical decision processes.

10. To increase understanding of the desirability of remaining flexible and mobile with respect to career plans.

11. To provide equal opportunity for all users to gain access to occupational, college, and financial aids information.

12. To give users a national outlook and potentially expand the range of colleges they consider.

13. To reduce tension experienced by students [and parents] by informing them of realistic alternatives sufficiently early in their high school experience to permit modification of plans. (*Resource Kit*, 1981, p.5)

Limitations

GIS does not contain on-line didactic material or lengthy instructions. It does not guide the user's interaction but allows free use of any command at any time. It does contain concise descriptions of more occupations and educational institutions than the other CACGS reviewed here. It also offers more ways of sorting and retreiving information than most CACGS. Thus GIS offers great flexibility and speed of access. In settings where counselors or career technicians trained to use GIS retrieve information for the clients, these characteristics can be valuable.

II. DIDACTIC COMPONENTS

There is no on-line didactic material. A small amount of didactic material is contained in the *Guide* (user handbook). The *OCCU Index* groups occupations by cluster as an aid to teaching. The *Resource Kit* contains samples of activities and the thrice-yearly user newsletter often has explanatory material of various kinds.

III. ASSESSMENT COMPONENTS

GIS does not provide on-line assessment, but an access strategy is built into each of GIS's six information files. Unlike other CACGS, the access strategies are presented in the form of hundreds of attributes which can be used to search for relevant information. Each file has a different set of attributes which are listed in the *Guide*, but the same logic is used for all files. As the user enters an attribute to search a file, GIS reports the number of occupations (or schools) left on the list. Thus clients can immediately see the impact of their choice.

The search commands are:

A Add a topic (or restriction). Only those occupations (or schools) which have this attribute will *remain* on the list.

S Subtract a topic. All occupations (or schools) which have this attribute will be *removed* from the list.

E Either add one topic/or another. Only occupations (or schools) having one and/or another of these attributes will remain on the list. Two or more attributes can be used with the E command.

D Delete a topic. Any topic previously entered (A,S,E) may be erased if you change your mind.

N Names of remaining occupations (or schools) will be listed.

Using this set of commands, users adjust their list of occupations (or schools) until it fits their needs.

Topics

The access strategy for occupations contains about 350 attributes (informational topics and classification systems) which can be used to search for relevant occupations. The topics include the U.S. Department of Labor's Data-People-Things, Aptitudes, Physical Demands, Work Conditions, Lifestyle (work hours), Salary Ranges, Employment Potential and Training Routes. Four ways of structuring the world of work are also available for searching for occupations: *Dictionary of Occupational Titles* categories, Standard Occupational Classification Groups, Office of Education Clusters, or Worker Trait Interest Areas.

The access strategies for various types of educational institutions contain up to 900 attributes, including majors, regions of the United States, city size, type of institution, school size, religious affiliation, selectivity, cost, campus activities, and many other items.

Data Base

The data base used for the occupational search process is the U.S. Department of Labor *Data Display* and *Occupational Outlook Handbook*, plus an analysis of salaries, employment potential and "lifestyle" (overtime or leisure) offered by each

occupation. For the educational files, the search process uses data reported by each institution.

Logic

The logic used by GIS is both simple and complex. The commands are few and the explanations are very brief and clear. As a result, GIS seems to be quite easy to use. Unfortunately many clients have difficulty grasping this type of logic and can get lost as they adjust their lists to fit their needs. GIS sites often use a trained facilitator to assist clients in clarifying their choices before using the terminal and in threading their way through the search process.

Relevance

The topics available in GIS for sorting occupations include all of those mentioned in Chapter Three except values, personality types and skills. Because there are so many ways to sort occupations (or schools), almost everyone will find relevant topics. There are no implied "shoulds" in GIS since all topics are offered without comment, and they can be used in any order. Users are encouraged to plan their use of GIS topics in priority order with worksheets provided in the *Guide*.

Interactivity

Since every command produces instant feedback, the level of interactivity is quite high.

Reading Level

According to TSC, GIS is written at the seventh grade reading level using the Fry System for reading level analysis. However, the technical nature of many of the attributes raises their reading level somewhat above the seventh grade level.

IV. INFORMATIONAL COMPONENTS

Topics

GIS contains six files (see Table 3), each of which has two ways of displaying information:

P Prints information specific to an occupation or school.

Degree of Detail

I Itemizes the attributes of an occupation or school. The specific information is very concise. Using the "P" command with an occupation number causes the computer to print a brief occupational description, related job titles, a bibliography, and an

INFORMATION FILES

The *Occupational Information File* (OCCU) contains 875 primary occupational listings with reference to approximately 2500 related jobs. Using GIS, you will find information about the kind of work involved in an occupation, how much education or training is needed to qualify, what aptitudes are required, working conditions, salary ranges, and much more. An important feature of the Occupational File is its cross-referencing system which directs you to a wide variety of multi-media materials for more information about occupations.

The *Armed Services Occupational Information File* (ASOC) contains basic information about more than 100 occupations in the Armed Services. For each occupation you get a general job description as well as lists of related military and civilian occupations.

The *Two-Year College Information File* (COL2) and the *Four-Year College Information File* (COL4) let you explore information about more than 3300 colleges, universities, and technical institutions. The information about the colleges includes programs of study, location, size, competitiveness, costs, accreditation, national test scores, athletic programs, special services, campus activities, and more. The information found in both the COL2 and COL4 files comes directly from the participating colleges and universities. It is updated each year and carefully checked for accuracy.

The *Graduate and Professional School Information File* (GRAD) contains information on over 1500 graduate and professional institutions across the country. Information provided includes programs offered, degree requirements, financial aids, residence information, placement of graduates, and more.

The *Financial Aids Information File* (AIDS) contains information about national scholarship and financial aid programs worth millions of dollars. A description of the financial aid offered, the eligibility requirements, application deadlines, and where to write for more information are provided.

Note: Some states or regions now provide local information for GIS users in special files such as the State Occupations File, State Vocational-Technical School File, State Financial Aids File, Local Business and Industry File, or other files. Check to see if such additional GIS information files are available at your GIS site.

Table 3.

address to write to for more information. For each school the printout includes the address, telephone number, enrollment, percent of returning freshmen, median SAT and ACT scores, tests required for entrance, branch locations, application deadline, tuition and fees, and room and board costs. Additional information can be obtained by using the "I" command to list the attributes for a specific occupation or school. The "I" command causes GIS to print all the attributes which are true for the occupation or school while not printing any attributes that are not true. This list can be very informative and covers all of the topics included in the attribute list for that file.

Reading Level

According to TSC, the occupational information is written at the 7th grade reading level, using the Fry System for reading level analysis. The Quick Occupational File, an optional GIS file written at the fifth grade level, is available for lower-level readers.

Accuracy

Updates to GIS are provided twice a year, in September and in January.

Localization

Localized information can be added to the GIS. Eighteen institutions, state agencies, and Educational Opportunity Centers have already contracted with TSC to add local data. If there is no localized version of GIS in your area, you may arrange with TSC to add this information. For an additional fee TSC will develop and add the localized information, or they will provide training and technical materials to your state or local system if you plan to do your own updating.

Data Sources

According to TSC, the information used for the occupational files came primarily from the U.S. Department of Labor and professional associations. Sources include the *Occupational Outlook Handbook*, the *Dictionary of Occupational Titles* and supplements, the *Monthly Labor Review*, the *Occupational Outlook Quarterly*, and the *Encyclopedia of Associations*, among others. Brochures or written descriptions from professional associa-

tions are used when available, and the associations are asked to verify salaries and other information.

Interpretation

The information is condensed into terse statements following a consistent formula so that the most important information is conveyed efficiently.

V. INTERNAL STRUCTURE

Cross-referencing

Occupations contain cross-references to the college majors, and are cross-referenced in the reverse direction in the *Resource Kit* (counselor's manual). The college files can be searched by financial aid categories, which provide a cross-referencing system between these two files.

On-line Instruction

The computer commands are very brief (e.g., A2 or P27). GIS then spells out each command so that the print-out is easy to interpret. The most useful, basic instructions are contained in the *Guide*. These are also brief and very well written. Additional commands and information for facilitators are found in the *Resource Kit*. These commands allow a more economical, tailored use of GIS.

Flexibility

This system is exceptionally flexible since all actions are user-initiated. Once the user understands the logic of the system, movement between modules is fast and easy. The design of the system is also exceptionally simple. This simplicity adds to the number of decisions the user must make, so from the user's point of view GIS is the most complex CACGS reviewed here.

Complexity

Type of Use

The average on-line time is five to ten minutes per user. There is no memory of the user; since the access strategy is very short, once on-line, no memory of the user is needed. Clients may return as often as they like to get information or try a new set of topics. Each entry is fast and need not be repetitive.

VI. SYSTEM MANAGEMENT

Supporting Materials

TSC publishes a Career Guidance Catalog listing

available GIS supporting materials, each of which is purchased separately. GIS materials include the *GIS Guide* (user handbook), the *Resource Kit* (counselor's manual), "GIS Indices" (included in the *Resource Kit*, listing occupation and school numbers for direct information access); the "Training Set: A Trip to the Pyramids" (user filmstrip/cassette), "Pathways to Career Planning" (user workbook for the occupations file) and "Command Cards" (reference cards summarizing user commands).

The data files are available in other formats. "Micro-Search" is a set of microfiche containing all GIS data. "Job Lab" is a set of cards containing occupational information at three different reading levels for different school populations. "Colledger" is a set of rolodex cards which provides partial college and financial aid information. Other career educational program and professional materials are also available.

Service

In-service training on-site is included in the cost of the GIS license. The system has an active user network, including a newsletter. Consultation services are available at extra cost. The data quality is well respected and the distribution schedules are dependable.

Evaluation

The bibliography at the end of this chapter lists some of the research studies which have been made concerning the effectiveness of GIS. This list was provided by TSC.

VII. SYSTEM REQUIREMENTS

Computers

GIS runs on many different types of computers.

The larger computers include:

HP 2000 Access
HP 2000 C
HP 2000 F
HP 3000
TSC 200
Burroughs 6800 Series
PDP 11 (RSTS 6C)

DEC 10
DEC 20
CDC Cyber Series
Honeywell (various models with GCOS)
IBM 379 (various operating systems)
PRIME 400

GIS also runs on the TSC Dolphin and Apple III microcomputers. Those sites which do not have a computer can make use of GIS via a telenetwork to TSC computers.

GIS is written in BASIC, BASIC+, FORTRAN IV, ASSEMBLY, and PASCAL languages. GIS takes approximately 4-6 megabytes of storage on most systems.

Terminals GIS is usually used with a printing terminal; however, any asynchronous terminal may be used.

Cost GIS costs $3,100 to license the first site for one year, as of July, 1982, but special rates can sometimes be arranged for other cases. Since each client needs only five to ten minutes if their information requests are pre-planned, one terminal can serve up to 4000 clients per year in an educational setting (six hours per day, academic calendar) and more if evening use is possible.

FURTHER READING

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Chapter Six

ANALYSIS OF THE SYSTEM OF INTERACTIVE GUIDANCE AND INFORMATION

The System of Interactive Guidance and Information (SIGI) is probably the most theoretically pure computer-assisted career guidance system (CACGS). It was conceived by Dr. Martin Katz, a senior researcher for the Educational Testing Service, using grant funding from the Carnegie Foundation, was field tested with funding from the National Science Foundation, and was expanded and converted to run on microcomputers with funding from the Kellogg Foundation. It is designed to teach values clarification and the decision-making process to college students and underwent ten years of development and field testing. Its quality and the research behind it reflect the high standards of its creators.

Although research demonstrated SIGI's effectiveness, colleges have been very slow to buy it. With the advent of a microcomputer version of SIGI, its use appears to be growing more rapidly, and in 1982 there were about 150 institutions using SIGI.

I. SYSTEM GOALS

According to Dr. Katz,

The main purposes of SIGI are to increase students' freedom of choice, to develop their understanding of the elements involved in choice, and to improve their competence in the process of making informed and rational career decisions. In this process, they examine their own values searchingly, explore options systematically, interpret relevant data accurately, and formulate tentative plans as hypotheses that can be tested realistically. They also learn to modify their plans as they gain new insights, experience, and information (Katz, 1980, p.3).

Philosophy

Dr. Martin Katz has explained his philosophical orientation in several articles and publications (Katz, 1963, 1966, 1969, 1974). He begins with a critique of the trait-and-factor theory, which assumes that if we can discover the true factors that lead to success in an occupation and identify the corresponding traits in young people, we will know which occupations are "best" for them. Departing from this model and defining "the guidance model" as an alternative, Dr. Katz believes that a humanistic process requires that individual values and manpower needs be assessed by the individual in selecting an occupation. Therefore SIGI assists clients in identifying their values, teaches them a decision-making process, and offers them a structure for making decisions based on an evaluation of rewards and risks associated with each option.

Objectives

SIGI was designed for use by college students. After signing on for the first time, clients progress through each of the six subsystems in the order presented, since this sequence constitutes the model for career decision-making taught by the system. Later, the client is free to use any subsystem at any time. In order to achieve the objectives listed above, SIGI has an Introduction and six subsystems. In VALUES clients examine

their occupational values very closely; in LOCATE they identify occupations which meet their specifications with respect to values; in COMPARE, clients compare three occupations at a time, asking questions and receiving accurate, up-to-date information; in PREDICTION (an optional section) clients see the probability of success in programs of study at the college they are attending; in PLANNING, they find information about the preparation needed for entry into occupations; and in STRATEGY they are taught a decision-making strategy that helps them analyze the risks and rewards offered by occupations. Thus SIGI assists clients in clarifying their work values and provides instruction in the decision-making process.

Limitations

Grounded as it is in values, SIGI shuns some of the apparatus used in other approaches to career planning. It does not require interest or personality inventories or the formal assessment of abilities, although these aspects of occupations are part of the system's informational content. Clients for whom work in a particular field of interest is an important value may specify the field in their search for rewarding occupations, while other clients may ignore interests if other occupational values are more important. Also, SIGI does not offer so comprehensive a picture of the labor market as do systems designed with secondary students in mind. It contains write-ups of only 198 occupations (covering about 300 titles), of which 65 percent require more than one year of postsecondary training. Another possible limitation is that SIGI does not provide local labor market information or job search assistance. But those sites which use SIGI are enthusiastic about it, and research clearly shows that clients who use the system are better informed than nonusers about their occupational choice.

DIDACTIC COMPONENTS

Since the aim of SIGI is to teach a process for

rational decision-making, every module contains some didactic material. Each subsystem plays a role in the decision-making process (see Table 4), and at the same time provides information either about the client (VALUES and PREDICTION), about occupations and how to prepare for entry (COMPARE and PLANNING), or about linkages between clients and occupations (LOCATE and STRATEGY).

Topics

VALUES not only explains values clarification, it forces the client to compare values in a mock work setting. Clients are offered a "job" which features a particular value as its primary ingredient. Then they are tempted by the offer of another job that features a different value, or are advised that their current job is seriously deficient with respect to some other value. For example, let's assume a client designated Variety, Independence and Leisure as his/her top three values, in that order. If the clients' job features maximum Independence, and they decide to change to a job which offers more Leisure, SIGI warns them that this choice is inconsistent with their previous expressions of the importance of these two values. If the client had accepted a high Security job and refused a job with a lot of Independence, this would also be inconsistent.

This module is cleverly designed to minimize pat answers and force clients to think carefully about each response. Each time a new job is accepted, the new job becomes the point of comparison, and the system compares the new job with other jobs, until another job is chosen. In this way a sampling of relationships between values is tested. There are three versions of every temptation and every deficiency, so the client can meet the same value three times before encountering repetition.

After using LOCATE to identify occupations that meet or exceed the client's specifications with respect to potential satisfaction of values, and COMPARE to gather information and further

refine the choices, clients use PREDICTION to find their probability of success in various "key courses" in programs of study which are needed to enter the selected occupations. PREDICTION uses data which must be entered by the user institution. Clients supply information about their previous academic performance and rate themselves on factors that the institution has identified as predictive of grades in each key course. The computer uses the best combination of predictors, which may include test scores as well as the clients' own estimates of what their grades will be, to provide probability statements based on grades obtained by comparable previous students. The

System	What the student does	Step in the decision-making process
(Introduction)	Learns concepts and uses of major systems	
1. VALUES	Examines 10 occupational values and weights the importance of each	Find out what you want
2. LOCATE	Puts in specifications for 5 values at a time and gets lists of occupations that meet the specifications	Find out where you can get what you want
3. COMPARE	Asks questions and gets specific information about occupations of interest	Get information for judging the advantages and disadvantages of your options. Narrow down your list of options.
4. PREDICTION	Finds out probabilities of getting various grades in key courses of programs that prepare for occupations	Assess the probabilities of success for each option
5. PLANNING	Sees the steps to be taken to prepare for an occupation, including the program at the local college	Plan a course of action for each option
6. STRATEGY	Evaluates occupations in terms of the rewards they offer and the risks of trying to enter them	Apply a rational decision-making strategy to occupational choice

The DIGI systems and their place in the decision-making paradigm.

Table 4.

proper interpretation of these statistics is carefully taught by the text material, which gives exercises to be sure the client understands and practices using the prediction techniques. Many sites which use SIGI do not have this module because they have not undertaken the studies required for computation of the prediction equations. In this case clients go directly from COMPARE to PLANNING.

In PLANNING clients choose an occupation and assess their willingness and ability to engage in the education and training required for entry. Then they see the preparation that is recommended for the occupation. Institutions may at their option tailor this information to describe the majors and courses that their advisors recommend; otherwise, the information is more generalized.

STRATEGY is the last module and teaches the decision-making process. It begins with an example of this process and continues by applying this process to occupational choices. The values with the weight the client had assigned to each are listed vertically and the occupations are listed horizontally. The ability of each occupation to satisfy each value is displayed by the computer. (This data has been determined by analysts at ETS following rigorous procedures). The client's weighting of each value is multiplied by the occupation's ability to satisfy the value and these products are summed for each occupation (See Table 5).

The sum indicates the "desirability" of each occupation. SIGI then requests the client to estimate the probability of succeeding in gaining entry into each occupation. If PREDICTION is available on that computer, clients may compare their estimate of probability of success with the statistical probability of their earning a satisfactory grade in a key course. They are then asked to choose one of the three occupations and given a statement for that occupation about its potential rewards in terms of values satisfaction and its

VALUE	WT.	OCCUPATION		
		MechEng	CivEng	ElcTec
(1) Income	6	4 24	4 24	2 [illegible]
(2) Prestige	3	3 09	4 12	3 [illegible]
(3) Independence	5	3 15	4 20	2 10
(4) Help Others	2	1 02	3 06	1 02
(5) Security	6	3 18	3 18	3 18
(6) Variety	4	3 12	4 16	2 08
(7) Leadership	4	2 08	4 16	1 04
(8) Interest Field	4	4 20	3 15	4 20
(9) Leisure	3	3 09	3 09	3 09
(0) Early Entry	2	2 04	2 04	3 06
		---	---	---
		Sum = 121	140	98

Your weight for Income (6) X the rating of MechEng on Income (4) = 24, etc.

The sum of the products appears at the bottom of each column
The occupation with the highest sum is probably the one that would fit your values best. The highest possible sum is 168; the lowest is 40.
In general, a difference of 10 points or more between sums is significant.

For a copy press PRINT; otherwise press NEXT.

Table 5.
Computation of the Desirability of Occupations

potential risks in terms of their estimate of successful entry. (See Table 6.) They may repeat this process with different occupations as often as they choose.

Presentation

The explanatory displays in SIGI are presented on a CRT screen; clients can read them but do not usually retain a copy. Summary displays and all displays of occupational information may be printed if desired. For a client who reads well and quickly, this method of presentation is enjoyable and effective.

Interactivity

Very little didactic material is presented in consecutive screens. The majority is offered in a highly interactive format, so that using the system feels like a game and the client's attention has no opportunity to wander. Each item is tightly tied to the task at hand. The theory presented is very sophisticated, so it is unlikely that the clients will have seen it before.

Relevance

When these concepts are separated from the magic of the computer, they become the subject of controversy. Estimating one's probability of success is often not a conscious part of making a decision, and the rigidity instilled by the quantification process removes some of the human element from the decision. Although this decision-making process definately has value, there is some controversy over its importance to the career planning process.

Reading Level

SIGI's didactic components are highly interactive. SIGI uses the technology of "programmed learning" very effectively and it has the flexibility and depth necessary for truly interactive instruction. This type of interaction depends heavily on clear instructions, and it is possible for SIGI's instructions to be unclear if not read very carefully. Although the reading level of textual material has been kept to about an eighth grade level, some of the occupational data and concepts are difficult for poor readers. But because SIGI constantly challenges the client, asks questions,

and presents information with time to process each addition, clients usually respond enthusiastically to SIGI and are highly motivated to complete it.

III. ASSESSMENT COMPONENTS

The LOCATE module provides assistance in identifying relevant occupations. It requests clients to select five of the ten values and to specify the minimum amount or kind of satisfaction that is acceptable in respect to each. For example, if High Income is chosen, clients may choose one of five levels of income from "Less than $13,000 per year" to "More than $32,000 per year." They make analogous specifications for the other four values. Then the computer identifies occupations which meet or exceed these requirements. If the list is longer than 40, clients are asked to tighten their restrictions. If it is empty, they must loosen their restrictions. Once a list has been created, clients are taught to ask why an occupation is not on their list, to change their specifications, and/or to change the set of five values. They can then receive different occupations lists based on the changes they have made. For most values there are four levels of specifications; there are five for High Income; and there are six different fields of interest.

Topics

SIGI uses ten values:

- Income
- Independence
- Security
- Leadership
- Field of Interest
- Prestige
- Helping Others
- Variety
- Leisure
- Early Entry

Field of Interest means that the client has a specific interest area in which he/she wishes to work. Early Entry means that the occupation

OCCUPATIONS	DESIRABILITY SUMS	CHANCES
140 Mechanical Engineer	121	50
124 Civil Engineer	140	40
130 Electronics Technician	98	75

You have chosen 124 Civil Engineer.

This occupation has the highest Desirability Sum or comes within ten points of the highest.

According to your estimate, however, it does not offer the most chances for getting into it.

Thus, in choosing this occupation, you have decided that the higher reward it offers is worth the extra risk of going after it.

That is a perfectly reasonable choice, provided that the risks are not so bad that you should reject this occupation under Rule 1 of your strategy.

For a copy of this display, press PRINT. Otherwise press NEXT.

Table 6.
Display Discussing the Rewards and Risks Associated with an Occupation

requires little training or few years of college. The other values are fairly self-explanatory.

These values were selected to meet three criteria:

- They are relatively independent of one another.
- Each was found to be important to some people in selecting occupations.
- It was possible to define an objective procedure for rating occupations on the opportunity they provide for satisfying the values. For example, creativity is a strong value for some people, but perception of what is creative differs from person to person, making an objective rating impossible.

One of the major criticisms of SIGI centers around the omissions from the list. It should be noted that many of the job characteristics used by other systems are included in SIGI as subdivisions under values (such as income); interests certainly are so represented. Only aptitudes (or abilities or skills) and a few job characteristics (such as City Size) are really missing from SIGI. And many items (such as Prestige and Security) are not explicit in systems which do not use values. So these items represent a fairly broad base for selecting occupations.

Data Base

Analysts at ETS used available data to rate each occupation on the ten values. The rating procedures have been explicitly defined and are rigorously followed. Nevertheless, the lack of "hard" data means that some ratings are informed opinions.

Logic

The logic of the LOCATE module is very similar to that used in other CACGS—it selects occupations which meet or exceed the requirements specified. The weightings clients have carefully assigned to their values are not used by LOCATE, but STRATEGY later uses the weightings to assist clients in refining their list.

Interactivity

LOCATE is fairly interactive. It teaches several strategies by example, then allows clients to adjust or manipulate their lists as they choose. However, this flexibility requires a fair amount of intelligence

and control over the end list requires a good grasp of the logic being used.

IV. INFORMATIONAL COMPONENTS

Topics

COMPARE and PLANNING contain the majority of the information. These two modules are separated by PREDICTION at sites where local data has been calculated for this module. COMPARE allows clients to select any three occupations and ask for any of 28 topics of information. The topic selected appears on the screen for all three occupations simultaneously so that clients can compare the three occupations with respect to that topic. After comparing the initial three occupations on as many topics as desired, clients can choose another set of three occupations.

PLANNING explains the preparation needed for specific occupations using several topics, including: duration of education, names of typical courses that must be taken, the rewards and risks of enrolling in a curriculum that may be too difficult, the college or training program usually taken and the content of the programs that are recommended. The client chooses one occupation and after each topic is displayed, the client is asked if he/she is willing or able to complete the requirements listed. After completing the planning information for one occupation, clients may see others or see alternate routes for entering the same occupation (if they exist).

Analysis

The types of information offered by SIGI are consistent with the specific goals of the system. SIGI makes no attempt to offer a school search routine, military information, job search assistance, or other types of information which might be of interest to a broader population. The occupations selected for inclusion are similarly limited. Although the degree of detail is high for occupations (there are 28 topics for each occupation) there is no localization, and the educational information is quite limited (although it will be greatly enlarged

in 1982) unless the user institution enters its own information. Updates are provided once a year and the information sources are described briefly in the *Counselor's Handbook* (Chapman, 1980).

V. INTERNAL STRUCTURE

Ease of Use

SIGI divides clients into "novices" and "initiates." A novice is required to go through each module in order. After completing the last module, STRATEGY, the novice becomes an initiate, and may use any module in any order. Since novices are required to move in the prescribed order, there is very little cross-referencing and most of the instructions point in only one direction. Within each module there is quite a bit more freedom. Once clients understand the instructions, they have some flexibility in some of the modules. Due to the complexity of the concepts being taught, however, the program must do most of the leading through the decision-making process, although it leaves decisions (including choice of occupation) up to the clients. Because of this and the close adherence to a theory of how career development should occur, there is probably less flexibility in SIGI than in any of the other CACGS reviewed here.

Type of Use

SIGI requires an average of 3½ hours for completion. Clients may stop only at the end of a module and three sessions are sufficient for most people. VALUES often takes most of an hour, so the first session is usually scheduled for an hour and clients may move more quickly through succeeding modules. Of course, SIGI must maintain a record of each client's progress to allow clients to reenter where they left off. (On the microcomputer version, no record is kept between sessions. Students are provided with a "placeholder" number for continuity.) Institutions may keep these records as long as they wish, but because of computer storage space considerations, they often purge them after one semester or quarter. Although clients may use SIGI again after

they graduate to initiates, it does not appear that this is common.

VI. SYSTEM MANAGEMENT

Supporting Materials

SIGI's license fee includes the cost of counselor's manual, installation instructions, other materials needed to run SIGI, and the annual update of occupational information. The system is used on a CRT so visual displays are built into the system, but no additional modes of presentation are used. Clients may get printed copies of informational displays.

Clients generally use SIGI without much assistance. The counselor's manual provides a great deal of insight into techniques for assisting clients if they need help. But in-service training for counselors is not usually part of the SIGI package and, if it is desired, usually involves hiring one of the counselors from a demonstration site for a day or two.

Service

During SIGI's ten years of development, ETS was highly responsive to criticism but made few changes in SIGI unless research showed that the changes were needed. Then SIGI staff was reduced, but development has continued with augmentation of the PLANNING subsystem, conversion to various computers, release of a microcomputer version, and increase in the number of occupations covered.

Support for implementation of local PREDICTION and PLANNING subsystems is available for an additional fee.

Evaluation

Evaluation of SIGI was carefully conducted at six sites across the country during the initial development period. The system has also been independently evaluated by numerous users. Copies of their research are available on request from ETS.

VII. SYSTEM REQUIREMENTS

Computers and Terminals

SIGI was originally written for the PDP 11/34 or

larger PDP 11 series, a minicomputer. It has now been converted to run on several other minis and micros: most DEC machines, Burroughs 6800, CDC Cyber 70, Data General Eclipse C-150, Perkin Elmer 3200 series, and the Prime 400. It requires 6400 + blocks of disc storage and CRT terminals running at 1200 baud with slave printers (e.g. printers which follow the instructions of the CRT).

It also runs on one microcomputer, the TRS-80 Model II. This equipment tends to be fairly reliable and counseling centers generally report satisfaction with the operation of the hardware. Of course, this equipment is fairly new so it is not yet possible to determine the dependability of the microcomputer as the hardware gets older. In 1982 the microcomputer hardware could be purchased from Radio Shack for about $5,000 including printer.

Cost

As of 1982, the software lease fee for the mini or mainframe versions is $2,400 per year for up to four terminals and $600 for each additional terminal. The micro version costs $1,200 for the first computer and $600 for each additional computer in the same institution.

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CHAPTER SEVEN

ANALYSIS OF DISCOVER

DISCOVER is an unusually comprehensive computer-assisted career guidance system (CACGS). It is composed of 21 modules which contain didactic material, several self-assessment inventories, and extensive information files. This second generation CACGS was developed by Dr. JoAnn Harris-Bowlsbey and benefited from her experience in developing CVIS (Chapter Two), one of the earliest CACGS. The development of DISCOVER I was sponsored by IBM and this system runs only on the IBM 370 and 4300 series machines and requires a light-pen terminal. Using this terminal and special pen, the client points out the correct answer on the screen instead of typing the answer. In 1982 Dr. Bowlsbey released a third generation system called DISCOVER II. Although it has some similarities to its predecessor, it is a substantially different system which contains four modules and runs on several microcomputers.

I. SYSTEM GOALS

DISCOVER intends to cover every aspect of

career planning and lighten the counselor's load as much as possible. According to the system brochure,

DISCOVER is a systematic career guidance program designed to enhance normal career development for grades seven through twelve. The study of career development theory makes it clear that a career guidance system should include at least the following components:

—self information, including values, interests and competencies

—exploration of occupations in a systematic way

—teaching and low-risk practice of decision-making

—relationship of self-information to occupational alternatives

—informational assistance with implementation of choice

(DISCOVER Foundation, 1976)

Philosophy

DISCOVER is an eclectic system, combining John Holland's *Self Directed Search*, American College Testing Program's "World of Work Map", Martin Katz's work values, and JoAnn Harris-Bowlsbey's concept of systematic guidance (Harris-Bowlsbey, unpublished). Although clients are free to choose any module(s), use of DISCOVER promotes systematic career development by maintaining records of past interactions so that clients may review their previous choices and either revise them or continue to other modules.

Objectives

DISCOVER I has two versions, one designed for the secondary level and another designed for the college/adult level. Although these two versions contain the same modules, the language and didactic material are slightly different. According to Dr. Bowlsbey, all versions of DISCOVER attempt to:

Increase decision-making skill

Increase vocational maturity

Increase specification of career plans

Offer a wealth of information about 417 occupa-

tions and thousands of educational institutions
Increase self-knowledge concerning interests, abilities and values.

Limitations

DISCOVER is intended to lead the client through each step of the career choice process. The system is based on the assumption that the process of choosing a career is fully understood and that each step in this process can be completed as the client uses the computerized modules. It is difficult to determine how thoroughly DISCOVER accomplishes this ideal, but research indicates that DISCOVER helps clients to increase in vocational maturity.

II. DIDACTIC COMPONENTS

Topics

Most modules in DISCOVER begin with didactic material. Module 00 begins with instructions for using the system and 1a teaches the definitions of values before asking clients to choose their most important values. Module 1b uses a Values Game to teach the distinctions among values. Modules 2a and 2b teach Decision Making Theory and 3a explains the structure of the world of work using the ACT "World of Work Map" and John Holland's personality types. Didactic sections begin most of the succeeding modules. Section 8 consists of ten information modules, each of which contain didactic material (definitions of terms and information).

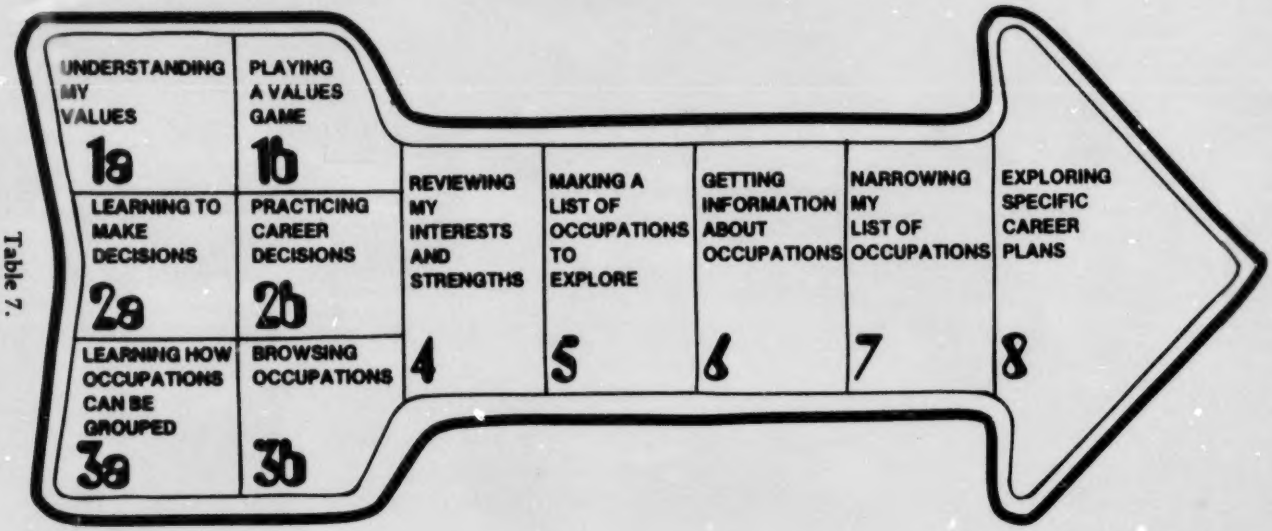
Presentation

The presentation of the didactic material is varied. Where it begins the module, clients are offered each screen consecutively. Modules which are highly didactic offer the material in game format, to make it more appealing, or in a menu format to allow clients to choose what they need. The content of the didactic material forms the structure around which DISCOVER is built. It ties the other components together so that DISCOVER can be used as a stand-alone course.

Interactivity

The didactic material tends to be slightly interactive. It is assumed that clients need all the

Table 7.


UNDERSTANDING MY VALUES
1a
PLAYING A VALUES GAME
1b
LEARNING TO MAKE DECISIONS
2a
PRACTICING CAREER DECISIONS
2b
LEARNING HOW OCCUPATIONS CAN BE GROUPED
3a
BROWSING OCCUPATIONS
3b
REVIEWING MY INTERESTS AND STRENGTHS
4
MAKING A LIST OF OCCUPATIONS TO EXPLORE
5
GETTING INFORMATION ABOUT OCCUPATIONS
6
NARROWING MY LIST OF OCCUPATIONS
7
EXPLORING SPECIFIC CAREER PLANS
8

information presented and individual differences are dealt with by assessing vocational maturity in Module 00 and recommending specific modules for each client.

Relevance and Reading Level

The didactic material teaches the career planning process described in Chapter One. The material is relevant for all who haven't previously studied this process. The reading level depends on the version selected. The high school version is written at the sixth or seventh grade level. The adult version, developed for a college and adult population (ages 18-22), uses different language and examples which are relevant to adults.

III. ASSESSMENT COMPONENTS

Topics

DISCOVER contains several occupational selection strategies. Modules 1a and 1b contain values clarification exercises which provide information about values and their implications for occupational selection. Module 4 contains Holland's *Self Directed Search* which assesses interests and abilities. The result is a three-letter Holland code (or several codes if there are "ties") which is used to identify an appropriate set of occupations.

After these experiences, clients have the option of reviewing the lists generated by five different sorting methods, including interests, values, job characteristics, school subjects or college majors, and client selection. Clients can merge these lists in any combination. Then, after reading descriptions of each occupation, clients are encouraged to prioritize their lists.

Self-Assessment Aids

Since each self-assessment instrument is handled differently, they will be analyzed separately. The Values Game (Module 1b) aids indirectly in self-assessment. Instead of offering comparisons of each pair of values as SIGI does, it illustrates the results of the client's choices. Clients can change their values if they don't like the results. There is

Data Base

little empirical data to relate values to occupations, so the coding was done by a panel consisting of Dr.

JoAnn Harris-Bowlsbey, Dr. Jack Rayman, and Dr. Donald Super (Harris-Bowlsbey, 1981).

Logic

The logic used is quite simple. The client selects a value and is asked to choose a level for that value. For example, if income is chosen, the client is asked to decide what level of income is desired. Then DISCOVER reports the number of occupations which may help the user attain that value at that level. Clients can then choose a second value and level, and they will be told how many occupations have that value at that level and how many have both values. They may choose values until the list goes to zero, and change them if the list does not contain the occupations they find interesting.

Relevance

The nine work values were developed by Dr. Martin Katz for SIGI. A tenth SIGI value, Interest Field, is not used since interests are dealt with in other modules of DISCOVER. For the relevance of these values, please refer to the research done for SIGI.

Interactivity

Much of the didactic material, including the Values Game, is slightly to moderately interactive. Once clients begin choosing values to create occupational lists, their control over the process increases.

Self-Assessment Aids

Interests are assessed by the Self Directed Search (SDS) which asks clients a large number of questions and calculates a score for each of six possible categories or personality types. The three top-scoring personality types, arranged in order of

Data Base

importance, are used to determine the occupations on the client's list, resulting in 120 possible lists. The data base used was constructed by John Holland. The instrument is widely used by various

Logic

audiences apart from DISCOVER. The on-line version is the same as the off-line version, except that the scoring is done by the computer. Questions are asked consecutively and scored at

Interactivity

the end.

IV. INFORMATIONAL COMPONENTS

Topics

DISCOVER contains seven information modules and space for several locally developed information modules. The modules provided by DISCOVER cover over 400 occupations, scholarships or financial aid sources, four-year colleges, community colleges, graduate schools, technical schools and military programs of study. Files which can be developed by the user site include local jobs, local employment outlook for occupations, names of people in the local area working in each occupation, occupational reference materials at the user site, apprenticeships, and continuing education.

Analysis

For the occupational information, clients are offered up to twenty-two questions which they may ask about each occupation (three of these items will be blank unless the user agency has entered local data). Each of the remaining modules begins with a search strategy and leads to a list of appropriate institutions. Most of the educational information is obtained from the American College Testing Program. Updates are available in August each year. The general information is reviewed each year, as are the occupational questions concerning salary, outlook, and training. Other occupational information is reviewed on a three-year cycle. The two- and four-year college files are new each year and the trade and technical school and graduate school files are revised every two years (Bowlsbey, unpublished).

V. INTERNAL STRUCTURE

Ease of Use

The instructions are comprehensive. As with all systems, clients who read the instructions too quickly may have to back up and read more carefully if they misinterpret the instructions. Since the system is designed to be used in one direction only, there is little cross-referencing between files. Clients are expected to define their goals as they move through the system so that they need only

specific types of information by the time they reach the final modules. The system is flexible in that clients may skip modules or parts of modules, but they are expected to use each module in the normal order. Thus there is little complexity to the structure.

Type of Use

A client could use the system for twelve hours or more, but the average use reported by one site was 3 to 4 hours (Bowlsbey, unpublished). The most popular modules were: 3b Browsing Occupations, 4 Reviewing Interests and Strengths, 5 Making a List of Occupations, 6 Getting Information about Occupations, and 8d Four-Year College Search. Some educational institutions use DISCOVER as a course and give a unit of credit to those who complete it.

Users may take a break whenever they complete a module. The system remembers them and their past progress. User accounts can be retained as long as the client remains at the user agency to allow clients to return after exploratory activities a year or two later and revise their answers to selected modules.

VI. SYSTEM MANAGEMENT

Supporting Materials

A detailed counselor's manual which accompanies the system helps counselors understand which options clients are offered and why the system behaves as it does. A list of occupations is kept beside the terminal, but no other user materials are needed. Alternative activities are suggested for each of the modules so that counselors or teachers can supplement the client's experiences on the computer. The data files are not printed, but other materials are suggested for clients who do not have access to the computer.

Service

An *In-service Training Manual* is available so that a site coordinator can train the other staff. A DISCOVER staff person will provide in-service training for an additional fee. Updating information is also optional (at extra cost). An annual

meeting of CVIS and DISCOVER users is held to encourage further training and feedback from users. When problems are discovered, changes are made in the system to correct them.

Evaluation

Usage statistics are not collected by the computer; sites must maintain a log of users if they wish to keep this information. An evaluation of DISCOVER was conducted in 1976 by the DISCOVER foundation and the report was published in the Vocational Guidance Quarterly. (Rayman, 1978)

VII. SYSTEM REQUIREMENTS

Computers and Terminals

DISCOVER offers two hardware options. DISCOVER I runs only on large IBM computers, the 370 series or 4300 series. It requires an IBM 3270 terminal with a light pen or an equivalent terminal. A printer is desirable so that clients can keep sections of the print-out which they may wish to refer to again.

Dependability

This equipment is usually highly reliable. Although the light-pen terminals are a bit particular about where the pen touches the screen, users seem to adapt quickly to them.

Cost

The initial software cost is $1,000 per month for 24 months to use DISCOVER on one computer. This fee covers a perpetual license and allows as many sites as desired to access that computer. If a single site plans to use the computer, DISCOVER I is the most expensive CACGS. However, if several sites use the same computer, the fee becomes more manageable.

In 1982, the cost of each terminal was approximately $4,000; yearly update tapes cost $1,500; in-service training cost $200 per day, and all other materials were sold at cost.

Computers

DISCOVER II is quite different from DISCOVER I and time should be taken to explore the differences before purchasing either system. DISCOVER II was developed for a single-terminal microcomputer and the content has been substan-

tially compressed and revised. A microcomputer which uses an S100-BUS and associated terminal equipment with either two floppy disk drives or a hard disk can be purchased from DISCOVER Foundation as a package. The software is being developed to run on the TRS-80 Model II and on an Apple II with a Corvus hard disk; a subsequent version is planned for the IBM personal computer. A videodisc player may be added to the system to provide audio-visual displays in addition to the written information. If hardware is purchased from the DISCOVER Foundation, the floppy disk system costs $6,000, the hard disk system costs $9,000, and the videodisc player is an additional $2,300. For more details on the hardware requirements, contact DISCOVER Foundation.

Cost

In 1982 the software for any of these versions cost $1,500 for the first computer and $800 for each additional computer under one contract for the first year. For each additional year the cost was $750 per computer. Since each client could spend from three to four hours using the computer, sites with large numbers of clients may wish to have more than one computer. Materials and in-service training are additional costs.

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CHAPTER EIGHT
ORGANIZATIONAL PLANNING

A computer-assisted career guidance system (CACGS) is very attractive to clients and motivates them to think about their future and use a career library. But building it firmly into the career counseling program at your institution assures that it will be fully and properly utilized. This chapter relates the career planning process described in Chapter One to the organizational planning which is essential to the integration of a CACGS into your counseling program. Sample plans will be explored for different types of institutions and the process of implementing them will be discussed.

I. PLANNING CAREER COUNSELING PROGRAMS

Human and organizational limitations prevent institutions from achieving perfection, but what would perfection be like from a career counseling point of view?

- First, it would be a comprehensive program.

Rather than a series of isolated activities or materials, the ideal career counseling program would begin in kindergarten and continue throughout an individual's years in school, with continuing support which is easily available for adults of all ages as they continue their career development.

- It would be preventative, preparing clients for career choices before they must face them.
- It would be systematic and fully integrated into the educational program.
- It would utilize a wide variety of resources in the community.
- It would teach clients the process of career decision-making so that clients would be free to reuse this process when they face a new choice point.
- It would provide concrete evidence of its effectiveness so that its value would be clear.

Elementary School Program

Ideally, career guidance would begin in elementary school. At this level activities would be designed to increase self awareness, build self-discipline and other work-related skills, encourage individual decision-making, and increase career awareness. For fifth and sixth graders, career awareness could also be related to the educational choices students will face beginning in the seventh grade. A CACGS could be useful in several of these areas. First, an appropriate self-assessment module could help students to focus on their abilities and interests, and the relationship these have to their future work. Second, by describing the skills needed for each occupation, a CACGS can help students to understand why they need to develop various work-related skills. Third, because it makes career exploration so easy, it can assist in motivating students to view themselves in a variety of work roles.

High School Program

In approximately seventh grade the choices in educational programs become more visible and students need to understand how these choices

affect their future. The goals of a program at the middle school through high school level would include:

- Development of a sense of self
- Clarification of personal values
- Exploration of interests and capacities in relationship to work
- Learning to make decisions

Perhaps the ideal junior-senior high school program would look something like this:

GRADE LEVEL	ACTIVITY
7	Career awareness and exploration
8	Career planning and course selection
9	Reevaluation and course selection
10	Reevaluation and job search skills
11	Education and training program planning
12	Vocational choice and job keeping skills

The seventh grade unit could be a short unit in an English or social studies class and could combine assessment information with occupational requirements and educational planning. Emphasis would be on understanding and selecting occupational clusters and high school courses needed for each cluster. A CACGS could be used for this information and for illustrating the connection between educational achievements and occupational options.

In eighth grade some very important educational choices must be made. A slightly longer career unit, emphasizing the permanent effects of these choices and the high school courses needed for each cluster would be very valuable just before the ninth grade course selections must be made. Ability assessment and interest inventories might be appropriate here, along with individual contact with a counselor. A CACGS could be very useful in clarifying the impact of assessment information on career options and for facilitating occupational research. Thus the student's aware-

111

ness and readiness could be enhanced before meeting with a counselor and the time spent with the counselor could be used more profitably.

In ninth and tenth grades students will be reevaluating their previous choices in light of their present interests and achievement. Some students will be looking for jobs. Short units in each grade with more career exploration opportunities would be helpful. It would also be valuable to teach students the career planning process so that they can monitor their own progress. A CACGS could do this and it would be valuable for students as they practice the planning process.

In eleventh grade as students begin to make plans for a postsecondary education, information about colleges and apprenticeship programs is needed. Here a CACGS could be especially useful for sorting through the masses of information available.

In twelfth grade final reassessment takes place and firm plans are made for the initial work experience or college program. In many high schools, students will have been separated by now into college preparatory and vocational programs. Although the information needs of these groups may differ, most high school seniors are highly motivated to seek career information and a CACGS could provide the type of individual attention which they desire. Because it responds directly to their questions and provides relevant information, it could help to overcome the fear and frustration many high school seniors experience. Follow-up counseling would also be essential to be sure that the information is interpreted and utilized well.

Few schools have programs that are this comprehensive. Many begin career planning in ninth grade with a unit in an English or social studies class. Some maintain career folders for each student so that previous choices may be reevaluated each year. Some offer a quarter or

one-semester course to cover all aspects of the career planning process. Many have a career center and encourage its use by classes and on a drop-in basis.

It is difficult to maintain a coordinated iterative process in a school setting. Each year students are covering some of the same material, but the teachers may change, some students come and go, and each student matures at a different rate. Some students will have the same career goals each year and find the units repetitive. Other students will refuse to use the same materials a second year. And yet enough students change their goals each year in high school that annual reassessment is meaningful.

Whether you select a yearly career unit or an abbreviated program, the CACGS needs to be fully integrated into the process. Since only one person at a time can use a terminal, scheduling a whole class to use it will be a problem. A creative but flexible and easy scheduling process will have a lasting impact on the continuity of the program. The cooperation of the faculty in allowing students to miss portions of a class to use the CACGS makes the scheduling process much easier. Planning to use different segments of the CACGS for each grade level may also ease the scheduling problem if the CACGS can be used effectively this way. Certainly the massive information files can be repeatedly integrated into occupational research units since the information is revised regularly and students can broaden their alternatives with each use.

College Program

In colleges, career planning programs tend to be quite different since the student assumes more responsibility for the process and there are fewer required courses. A comprehensive program might look like this:

Orientation:

Assessment of vocational maturity

Optional Assistance:

Career planning course
Cooperative work experience
Individual and group counseling
Exploration through breadth requirements
Academic advising

Placement:

Job Search Assistance

Ideally students would be encouraged to assess their career planning needs at the beginning of the college program. This might be accomplished through an orientation class, an interview with a counselor or academic advisor, a comprehensive testing program, or various other means. A reality check also might be useful to the students, either through work experience or a comparison of past academic success with the requirements of their chosen occupations. The appropriate form of career planning assistance could then be selected from those offered on campus. Periodic review with a counselor or faculty advisor would lead the student to other appropriate forms of assistance as the student gained vocational maturity.

The CACGS can be utilized for career planning assistance in two ways: it can be integrated into the career planning course and it can be used on a drop-in basis in conjunction with counseling. In some colleges these two options are merged as students are referred to a counselor who designs a set of experiences, which include the CACGS, for course credit.

Agency Program

In counseling agencies or adult training programs the process is usually quite different. The career counseling programs found in agencies vary from individual sessions to meet the diverse needs of adults to carefully predesigned small group workshops. Lack of hardware dependability and other technical problems can be extremely disruptive in this setting. Unless a paraprofessional is available to assist clients with the use of the CACGS, the cost of operating the CACGS

must be added to the cost of the counselor's time and the CACGS loses its cost-effectiveness. However, when these technical and scheduling problems can be overcome, a CACGS can be used to add depth and breadth to the program offered by the agency. Since agency programs usually follow very closely the career planning process as described in Chapter One, please review that discussion to see where the CACGS can be integrated into your program.

Commitment

Whatever career counseling program is chosen, it is important that administrators value and support it. It is also important that the counselors and staff who must implement the program have a major role in constructing it. And finally, it is important that procedures be developed to facilitate each step in the program and institutionalize it. Once the program becomes fully entrenched on a procedural level, less energy will be needed to keep it moving smoothly.

II. GETTING STARTED

Initial planning before installing a CACGS is often overlooked. Typically one person at an institution finds computers exciting and secures the tacit agreement of the necessary administrators to subscribe to a CACGS. This person is often an enthusiastic, energetic mover whom others respect and encourage from the sidelines. As long as this person stays in the same position, the CACGS hums away in the career center and everyone else more or less ignores it. But if this person leaves, the CACGS may become increasingly neglected and resented by those who inherit it. Since it was never really integrated into the counseling program, it is an easy item to cut in times of budget constraints.

Resistance

CACGS make friends easily and offer many exciting new services. Then why are they so difficult to integrate into the counseling process? Since counseling is such a private and intangible

activity, perhaps counselors feel a bit jealous of this flashy new machine that attracts so much attention. Certainly some counselors fear computers or view them as alien. Counselors may also feel frustrated at having so little control over the CACGS since it does what its author believed was valuable or what the programmer decided it would do rather than what the counselors would like it to do. Others may be angry that so much money is being spent on something they previously got along without.

Integration

Whatever the reason, resistance to CACGS is very common. By integrating the CACGS into the career counseling program before it is procured and continually each year thereafter, it may be possible to forestall or minimize the resistance.

Selection

The first step, described in Chapter Three, is to involve everyone in the initial planning process. This process should focus on the needs and priorities of the staff at your institution. If the discussion is allowed to turn to the actual CACGS available, computer buffs will have an advantage over other staff members and factions and frustrations may begin to form. Instead, a committee or an individual should be selected to evaluate the existing CACGS according to the needs of the institution. Since there will probably not be a CACGS which fits perfectly, arguments and factions easily develop at this point. As long as these disagreements are dealt with in committee, they are constructive and valuable in focusing attention on the advantages or disadvantages of each system.

Installation

Once a CACGS has been selected and dissention has been worked through, the CACGS can be installed. A period of time (a week to two months) should be set aside for all staff to experience the CACGS as though they were clients. Then in-service training should be conducted for everyone who will be involved in any way. The in-service training should be a festive

occasion, to celebrate this new addition to the career counseling program. It is also a time to advertise the career counseling program, making sure that other staff members and community members know about and feel part of this new program.

Re-evaluation

Even the best laid plans need to be reviewed periodically. After a month or so the entire career counseling program should be reviewed to see if it is working smoothly. Perhaps a six-month review would be valuable. Every year an annual review and retraining should be scheduled. Staff members change, the "new" becomes old, and enthusiasm fades. Once a year (or more often if there are frequent staff changes) a reevaluation of the program should be conducted to encourage the expression of new ideas and the revitalization of old ones.

Vital to the integration of a CACGS into a career counseling program is a good manager with energy and attention to organizational issues. During the initial brainstorming and planning stage, the project manager should involve staff members in the selection process and procure their commitment to a CACGS. When the CACGS arrives, some time and energy will be needed to overcome the usual staff resistance to the changes in the program and to using the computer. Attention must also be given to explaining the total program to administrators so that they will not mistakenly view the CACGS as a replacement for counselors. The community should also be informed of the new service through public service announcements or other vehicles. If the manager of this project subtly and effectively enlists the cooperation of the counselors, staff, and community, the CACGS will become an integral and highly valued component of the program. The dramatic enhancement of the quality of the career counseling program which a CACGS can provide makes the effort well worth while.

FURTHER READING

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The National Vocational Guidance Association. "Theme Issue: Comprehensive Career Guidance," *The Vocational Guidance Quarterly*, Vol. 30, No. 4, 1982.

Chapter Nine
FUTURE DEVELOPMENT

The capability of computers to store, retrieve, and interrelate data assures their continued growth as a significant career guidance tool in the future. As computers continue to take over those tasks which they perform better than humans, they will continue to free counselors to spend their time counseling. It is essential that counselors guide this development so that future computer-assisted career guidance systems (CACGS) will incorporate the ethical and technical knowledge possessed by active professionals and become integral components in the career counseling process. This chapter lists some guidelines and explains the current barriers to development; you can help to overcome these barriers by carrying forth the research tasks mentioned here and contributing your observations and experience as you use computers in guidance. The body of "experts" is small and your wisdom is needed to guide the growth of this fledgling industry.

I. POSSIBILITIES

Micro Development

Technological advances in several areas have facilitated further development of CACGS. First, computers are becoming cheaper and personal computers are growing rapidly in popularity. This means that small programs for small computers will now be available to schools and counseling centers for a very low cost. Of course, the amount of data usually included in a CACGS is very large, but prices for storage of large amounts of data (hard disks) are also decreasing and will soon be within reach of schools, agencies, and even homes.

Telenetworks

The opposite of this "micro" development is the growth of large national networks. Several telecommunications networks now span the United States and satellite communications with microwave transmitters and receivers are rapidly lowering these costs. This allows very large, constantly updated data bases to be accessed by people throughout the United States. For rapidly changing information (like job openings), a large, centralized data base is essential.

Audio-visual Displays

The new videodisc player adds another dimension for CACGS. Unlike videotape players, videodisc players can skip instantly to any part of the videodisc, so it is possible to select brief presentations from any portion of the videodisc when the client wants them. Videodisc players could be used for giving instructions using programmed learning, occupational or educational program descriptions, introductions to colleges, simulated job interviews, interviews with various types of workers, and any other visual aspect of career planning. These presentations could be especially valuable to clients with limited reading skills.

New Services

As computer hardware becomes more available there are many aspects of career planning which could make better use of computers. These might include career awareness in elementary school, employee development in industry, job skills

120

training, employee selection, and matching job seekers to job openings. For example, job openings could be listed nationally by telecommunications and interviews could be conducted via telecommunications to facilitate the job search process at a much lower cost. The possibilities are limited only by our imagination.

II. GOALS

As CACGS become more sophisticated, they will become increasingly comprehensive and diverse in their offerings. DISCOVER, for example, is a third generation CACGS and attempts to deal with more aspects of the career planning process than other CACGS. Yet on close inspection, much remains to be done.

Varied Needs

Clients engage CACGS at all stages of career development. Elementary school children need an awareness of some of the questions they must face in selecting an occupation, and a familiarity with a wide variety of occupations. High school and college students must make hard choices among their values and select an initial entry point into the labor market. Adults have a wide variety of experiences to draw on and must sort through their own pasts to determine which elements are useful to their future. Future CACGS may be able to distinguish among these needs and offer components to satisfy each of them.

Varied Styles

Within each level, differences in the personalities of clients and counselors further complicate the choice process. Abilities, values, personality type, skills, interests, job requirements, and other elements all enter into the career choice process. Each of these categories produces meaningful, insightful results for some clients. CACGS with only one assessment module will probably be replaced by those which recognize differences in personal style and offer a variety of assessment and matching instruments. Future CACGS may begin by assessing learning style and personality type to

guide the user to the other elements in the CACGS which will be most meaningful for that individual.

Varied Information

An increasing variety of information modules could be offered. All CACGS offer a limited number of occupational descriptions for which salary and outlook information can be obtained. Even the *Dictionary of Occupational Titles* , which lists over 14,000 occupational descriptions (without salary or outlook information), lacks many of the new and emerging occupations. As CACGS become more sophisticated, the number of occupations on which accurate data is available could be expanded. Efforts to define a set of national occupational descriptions are currently under way. If this national information is maintained consistently and updated frequently, it can be used as a base system and local information can be added, where available. The result would be a comprehensive set of occupations with the specificity of localized information, where available.

Many other information modules are now being developed. For example, computer programs to match job openings and job seekers are currently available. As these expand, they will be similar to classified want ads. Since the computer can search quickly through thousands of listings to select those which fit the job seeker's qualifications, it provides a very useful, time-saving service to both job seekers and employers.

There are many examples of information modules which have been developed in specific areas. One CACGS is identifying non-accredited training programs, such as community based training programs and on-the-job training, to facilitate entry into the labor market. Other CACGS include interviews with people in special categories, such as interviews with disabled persons or interviews with women in non-traditional occupations to encourage career seekers to deal creatively with barriers they may encounter. Other CACGS list names of local workers who have agreed to discuss

their occupations with career seekers. If the need is great enough, a new module can be developed to deal with it.

Structural Improvements

Future CACGS will undoubtedly solve the variety of structural problems they now have. Greater flexibility and user control are very important. Most existing CACGS offer limited flexibility, perhaps because they believe each module is essential for each client, because their offerings are limited, or because a lock-step approach is less confusing to the client. However, the computer age has spawned a generation of sophisticated users who demand more control over their learning experiences.

Simultaneously CACGS try to simplify the instructions and the commands clients must use to get the information they need. Clients are increasingly impatient with lengthy instructions, and complex commands require a high level of intelligence or a lengthy training period. If increased control is given to the client, the client will need training to use this opportunity wisely. Either the CACGS will need a self-instructional module or educational technology will need to develop techniques for communicating options quickly.

Home Use

As CACGS become increasingly sophisticated in dealing with the multitude of user problems, they may no longer be restricted to counseling centers or agencies. As the use of home computers increases, telenetworks can offer CACGS along with their other services to home users. This would bring career guidance within easy reach of the general population, both adults and children. Perhaps home use of CACGS will help to reduce the current high level of job frustration by increasing vocational maturity and informed decision making.

III. BARRIERS

Computer Technology

Computer technology is almost ready for the

CACGS described above. In 1981, the hardware cost of a single-user microcomputer system to perform all the operations described above would have been approximately $11,000. If each user needed 4 hours to complete the program, the per user cost would be quite high. By 1982, several CACGS were available using hardware costing about $6,000. Technological advances are rapidly decreasing these costs, and by 1985 the costs will probably be quite affordable.

Educational Technology

Educational technology moves more slowly. As the field of computer-assisted instruction expands, new techniques for simplifying instructions will be developed. The videodisc will be valuable for communicating instructions, but its uses have not yet been fully explored. CACGS require highly sophisticated educational technology since they must perform counseling functions. To simulate the breadth and flexibility of the counseling situation, they must utilize the most advanced techniques of computer-assisted instruction. Much remains to be done in this area.

Career Guidance Technology

In spite of all that is known about how career decisions are made, much remains to be learned. One of the most widely used career assessment tools, the Strong-Campbell Interest Inventory, simply asks what the client wants to do. To use any other aspect of the client's personality to predict career choice requires extensive research into predictive validity. Although a variety of approaches matching clients to occupations can be devised, collecting accurate data on each characteritic for each occupation is costly. Until research indicates which aspects of personality are good predictors of job satisfaction, this aspect of any system will remain weak.

Cooperation

Good information on a large number of occupations is needed for a comprehensive CACGS. The magnitude of this data collection project requires a high level of cooperation among national and local government and private de-

velopers. In the past, counseling needs have had little impact on the type of data collected by the Department of Labor. If research pointed clearly to specific data needed for counseling purposes, these items could be incorporated into the data collection process.

NOICC, the National Occupational Information Coordinating Committee, was created to see that national data sources are made available to CACGS sponsored by local governments. State-sponsored CACGS usually adopt systems created by private developers, so cooperation among those sectors is increasing. As CACGS grow in popularity and sophistication, they will have an increasing impact on the data collection process. However, there are still many aspects of career information in which cooperation is lacking.

Funding

Of course, all of these improvements for CACGS depend on the availability of funds. As government sponsorship of projects in the area of education and counseling decreases, the development of CACGS will probably slow down. ETS, IBM, Houghton Mifflin and other large businesses have invested heavily in their respective CACGS. Both ETS and IBM substantially reduced their efforts after experiencing slow acceptance and a low level of sales. Microcomputers appear to be providing a boost in sales, but capital for further development of CACGS still appears to be limited.

The heaviest expenses for the guidance modules occur during the development phase, but for the information modules, maintenance costs are almost as high as development costs. As more occupations are added and increased accuracy of local information is demanded, the cost must be borne by the users or by local government. Limited funds will continue to limit the quality of the information.

Commitment

If commitment to career guidance remains high, these barriers can be overcome. Will enthusiasm wane as fads change? In times of economic

recession, will CACGS seem extravagant and senseless as people grasp for any available job to feed their families? Will confidence in the ability of computers to provide guidance services decrease? CACGS can and will become increasingly sophisticated and useful if motivation and interest remain high.

IV. STEPS TO BETTER CACGS

Functional Analysis

The individual guidance modules in the CACGS currently available demonstrate the potential power and value of CACGS, but these modules barely scratch the surface of career guidance. Detailed functional analysis of the career guidance process is needed to determine the other aspects of the career planning process which can be computerized. As other developmental tasks are identified and the most efficient techniques for dealing with them are compiled, new modules can be created to simulate the redundant aspects of the work now done by counselors or teachers.

Assessment Technologies

Matching people to occupations is an obvious task for a CACGS. But until valid assessment techniques are defined, computers can do little to improve the process. A great deal of research is needed in this area to determine how people choose careers and which aspects of work are most crucial to the selection process.

Occupational Profiles

Gathering accurate data for each occupation in a CACGS is a massive project. When the most effective assessment criteria have been defined, resources can be sought to develop accurate profiles for each occupation. By tying the assessment criteria to occupations empirically through careful data collection, the value and validity of the CACGS will be greatly increased.

Cooperation

Obviously these steps towards an ideal CACGS require increased cooperation among all the providers of career guidance and information. Counselors must be prepared to advise information researchers on the exact type and quality of

information needed. Information providers must fully understand the process through which their information will be used. And private developers must receive assistance from counselors in developing CACGS which promote good guidance practices, rather than developing impressive but superficial systems. As these professionals join forces, future clients will benefit from easily available, high quality career guidance and the level of job satisfaction in the United States may improve.

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Tiedeman, David V. *Designing our Career Machines*, Carroll Press, Cranston, 1979.

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APPENDIX A
GLOSSARY

ACCESS STRATEGY A method for approaching the information files. Since computers are capable of sorting large amounts of information very quickly, the access strategy usually uses information about the client to sort through the occupations or educational programs and select the ones which match the client's characteristics.

ACOUSTIC COUPLER A special type of modem which uses an ordinary telephone and converts the electrical pulses from the terminal to audio signals so information can be transferred over telephone lines to and from a computer.

ASYNCHRONOUS TERMINALS These terminals send each character to the computer as it is typed, unlike synchronous terminals which store up characters until an internal clock in the computer allows them a set amount of time to transmit. Most CACGS use asynchronous terminals because their operation is smoother and this type of terminal can be less expensive. Most computers can be adapted to handle either type of terminal.

BASIC* A high-level programming language designed to be used from interactive terminals. BASIC is very easy to learn, having been originally designed as a beginner's language. In some respects it resembles a simplified FORTRAN. BASIC is the language most often supplied with small computers.

BATCH PROCESSING Processing of data by computer in sequential form. Data is usually entered using IBM cards or machine-readable forms. Each set of data is processed in the order it is received. (See INTERACTIVE.)

BAUD This acronym refers to way of measuring the rate of data transmission. 300 Baud is roughly equivalent to 30 characters per second or 360 words per minute.

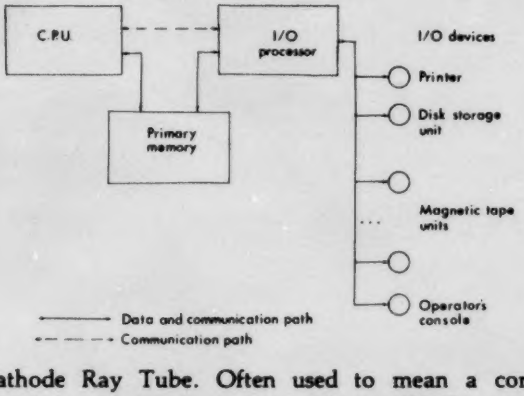
BIT* The smallest possible unit of information in a computer. One bit is enough to tell the difference between yes or no, up or down, on or off, one or zero; in short, any two opposites. Computers must represent information in the form of bits because the electronic circuits they are made of can have only two states: on or off.

BYTE* Originally defined as a subdivision of a long computer word, byte has come to mean a piece of information 8 bits long.

CAREER The totality of productive activities in which one engages during one's lifetime.

CLUSTER A group of occupations which share a common, fairly specific function such as providing health services or administering an organization. Occupations within a cluster share a substantial core of skills and knowledge and are frequently interrelated by production process or work environment.

CPU* Short for Central Processing Unit. This contains all the registers, arithmetic circuitry, comparators, and so forth that do the actual work of computing.



CRT Cathode Ray Tube. Often used to mean a computer terminal with an electronic vacuum tube or TV-like screen for visual display of information sent to and from a computer.

DATA* The information that the computer manipulates is called data. Data can be just about anything that can be expressed as patterns or numbers. In a CACGS, data consists of massive amounts of information about occupational or educational programs.

DATA ENTRY Entering of data into a computer through a computer terminal. Usually done at the CACGS' headquarters.

DISK* A magnetic disk is a thin disk of magnetic material capable of storing a large amount of information. It looks like a phonograph record and spins rapidly. Heads similar to heads in tape recorders read and write information onto concentric tracks.

DISK DRIVE* A disk drive houses several magnetic disks, keeps them spinning, and moves the read/write heads into proper position when information must be read from or stored on the disk.

DOT *Directory of Occupational Titles*, a Department of Labor publication which defines about 20,000 occupations.

DUPLEX Some computers communicate with terminals using full duplex and others use half duplex. Full duplex allows simultaneous two-way communication. Using full duplex, each character is sent from the terminal to the computer and returned to the terminal before it appears on the screen. This allows you to see exactly what the computer has received, and to communicate with the computer while it is sending information to you. Half duplex allows only one-way communication and each character is printed by the terminal as it is sent to the computer.

ERROR MESSAGE Most CACGS assume that the user will make mistakes occasionally. The program checks for these mistakes and prints error messages so that the user will know what is wrong.

FILE A computer file is a set of data which is used by a program. Since CACGS store each of their types of information in a separate computer file, the word is used commonly to mean a set of information, i.e. occupation file, college file, etc.

FORTRAN* FORTRAN is probably the most widely known high-level computer language. It was developed primarily for the sort of calculation found in scientific and technical applications. FORTRAN was the first language easy enough to learn such that users could write their own programs instead of depending on professional programmers. Expressions in FORTRAN have a strong resemblance to ordinary algebra.

HARD COPY A record of computer inquiries and responses printed on paper by a hard-copy computer terminal or a printer.

HARDWARE Electrical or mechanical equipment used to process data; includes terminals, acoustic couplers, central processing units, disk drives, tape drives, multiplexers, etc.

INTERACTIVE* Refers to a program or system that can ask questions of the user and then take immediate action based on his response. "Conversational" is often used to mean the same thing. (See BATCH PROCESSING.)

INPUT* This is information from the outside world which must be put into the computer to accomplish some task. Common input devices include terminals, card readers, paper tape readers, and magnetic tape drives.

LOCAL Many terminals have a setting labeled "LOC" or "Local." When this setting is used, the terminal is not sending information to the computer.

LOG-IN A procedure for validating legitimate users and allowing them to run a particular computer program. In a typical "log-in" operation, the user types on the computer terminal a predefined sequence of numbers and passwords which are checked by the computer to protect against incorrect or unauthorized access into the programs.

MAGNETIC TAPE* A popular medium for storing large amounts of information that doesn't have to be referred to frequently. Magnetic tape is wider and made to tighter specifications than the tape in your home tape recorder, but otherwise it's very similar.

MAINFRAME A large central processing unit which is very fast, processes complex instructions, and is capable of operating a large number and variety of peripheral equipment.

MEMORY* The memory of a computer is where it finds its instructions and the data it is to work with; also, where it stores its results. Memory is organized as a series of locations or cells, each of which can hold one word. The computer can read a word from a memory location, or it can store a new word there (in which case the old contents are lost). The locations are numbered

in sequence. These numbers or addresses enable the computer to refer to the memory. Memory is closely tied to the computer and can be accessed very rapidly. Items which are used less frequently are often stored on disk. When the CPU is ready to process them, it reads them from the disk into memory.

MICROPROCESSOR* Recent advances in integrated circuit-making have made it possible to put highly complex functions in a package the size of a domino. The microprocessor was born when semiconductor manufacturers decided to make what amounted to a CPU on a single chip (a small piece of silicon). The idea was that such a chip could be used as a universal process controller, replacing large amounts of complex circuitry in all sorts of equipment. Interesting things began happening when people started building little computers around microprocessors. Now microprocessors are designed with computing in mind, and some are directly modeled after existing minicomputers.

Microcomputers (or personal computers) contain a microprocessor and operator's console in one unit. Other devices may be attached as needed and these tiny, inexpensive computers can perform most of the functions previously performed by much larger machines.

MINICOMPUTER In the late 60's a new type of computer was developed which seemed very small and powerful. These minicomputers were often designed for time-sharing, another new concept then. Because of their low price and flexibility, many educational institutions bought them for instructional and/or administrative purposes. As computers continue to shrink in size, minicomputers now have as much speed and memory as mainframe (full-size computers) used to have. But mainframes continued to grow. At present, mainframes are used where high speed is needed for massive data bases (e.g., payroll for a large company) or complex computations (e.g., some scientific applications). Minis are used where time-sharing is important and small, less expensive systems are desired. Micros are used where complete autonomy or a very low price is desired, often without time-sharing.

MODEM A device which converts signals from a terminal or computer into signals which can be transmitted over a telephone line. There must be a modem at the terminal end and at the computer end of the telephone line.

OCCUPATION Jobs are grouped together and called an occupation when they exhibit similar job duties performed at about the same level of difficulty or responsibility using about the same skills, knowledge, and physical characteristics.

ON-LINE When you are communicating directly with a computer, you are on-line.

OOH *Occupational Outlook Handbook*. An excellent book containing national occupational information published by the U.S. Department of Labor every other year. It is available for about $8 from Government Printing Office bookstores.

OPERATING SYSTEM* A computer program which manages the operation of a computer. It makes sure the proper programs are in the right place in memory at the right time, handles input and output operations, and allows the computer to work for long periods without the direct intervention of the operator.

OUTLOOK The section of the occupational description which describes the relationship between supply (workers) and demand (jobs) for an occupation. Outlook takes into consideration not only the projected growth for an occupation but also the turnover rate, the supply of people to fill the openings, and the health of the industries in which the occupation is primarily found.

OUTPUT* Information which results from the computer's manipulations and which is to be delivered to the outside world. Common output devices include line printers, terminals, card punches, and magnetic tape drives.

PARITY A transmission error-checking technique. Parity can either be "off," "even," or "odd." All information in a computer is in the form of "bits" which are grouped in units called "words." During transmission an extra parity bit is added to each word. Using even parity, for example, the parity bit will always add to the number transmitted to make it an even number. If the computer receives an odd number, it will warn the operator that an error has occurred.

PASSWORD A predetermined code word used to make available a particular computer program and to keep unauthorized people from using the system since only certain people know the proper word(s) to use.

PORT The physical facility for connecting a line coming in from a user terminal to the computer.

PROGRAM* The sequence of instructions designed to make the computer carry out a given task.

SECURITY* Designers of multi-user systems have two difficult problems: how to keep unauthorized people from using the system, and how to keep users from reading or changing each other's files. Security measures usually include a secret password and a log-in procedure.

SOFTWARE* The word *software* refers to a computer's programs. If a particular bit of data manipulation is done through a program rather than by special circuitry, it is said to be "in software."

STORAGE Computer storage usually refers to data or programs stored on disk. CACGS usually are stored on disk until they are ready for use. When a user requests the CACGS (i.e., logs in) the computer reads the first part of the CACGS program into memory. As the user moves through the system, other parts of the program may be read into memory.

Usually the information requested is read directly from the disk to the terminal. Since reading the program and data on the disk does not destroy it, any number of users can be using CACGS at the same time. For each person, the computer will read the portion of the program they are using into their area in memory, so each person will be unaware of the others who are using the CACGS at the same time.

SYNCHRONOUS See Asynchronous.

TAPE DRIVE* Most large computer installations have several of these for reading and storing information on magnetic tape. Tape drives are easy to spot by the large spools moving jerkily on their fronts.

TERMINAL* A terminal is a device for communicating with the computer. It usually consists of a keyboard plus either a video screen (CRT terminal) or a printing mechanism like a typewriter (hard copy terminal).

TIME-SHARING* Time-sharing was developed to overcome the

disadvantages of batch processing. It enables many people to use the computer at once. Each user sits before a terminal which he uses to type in his commands. The computer responds to the user, then quickly shifts to the next user. The computer can do this so quickly that each user has the feeling of being alone with the computer. The biggest advantage of time-sharing is immediate response from the computer, and a chance to change your mind and see the results of the change.

TRACK Most storage devices (disk drives, tape drives, etc.) store information on tracks. For example, on a 9-track tape, each entry on the tape contains eight bits of information and one parity bit, with one bit placed in each track on the tape.

TRANSPARENT* Refers to something the equipment or program does that the user is not aware of. He "sees right through it."

VOCATIONAL MATURITY A state of readiness to make a wise vocational choice, including an accurate self concept, knowledge of the labor market, and skill in making rational decisions.

WORD* Most computers can handle only a fixed number of bits at a time. This group of bits is called a word. The longer the word, the larger the numbers it can represent, or the greater the range of instructions it can express. Larger business and scientific computers (mainframes) usually have words 32 or more bits long, while minicomputers typically have 12- or 16-bit word lengths. Microprocessors usually have an 8-bit word length. A few computers have a variable word length.

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APPENDIX B

COMPARISON OF COMPUTER ASSISTED GUIDANCE SYSTEMS

	CAREER SCAN IV & COLLEGE SCAN	Career Information System CIS
Contact for Further Information	Roger Lambert National Educational Software Services 1879 Locust Drive Verona, WI 53593 (608) 845-8410	Dr. Michael Neill National CIS 247 Hendricks Hall University of Oregon Eugene, OR 97403 (503) 686-3872
Year Development Began	1982	1969
Principle Designer	Dr. David Caulum Dr. Ronald Myren Dr. Roger Lambert Ms. Linda Abrahams	Dr. Bruce McKinlay
Delivery Systems	Micros: Apple II TRS-80 III Commodore PET	Mainframes Minis Other: QUEST: Micros Needle Sort Information: Books or Microfiche
Preferred Terminal Type	Black & White or Color Monitor	Hard Copy
On-line Time (per use)	20 min.	30 min.
Costs*	$169 for CAREER SCAN $195 for COLLEGE SCAN for perpetual lease fee.	$2.30 per user per year average. Varies among states.

*These costs are for comparison only. Check with a system representative for the actual cost for your site.

	Computerized Heuristic Occupational Information and Career Exploration System CHOICES	Coordinated Occupational Information Network COIN
Contact for Further Information	Bob Alexander CSG Choices 1101 Connecticut Ave., N.W. Suite 807 Washington, DC 20036 (202) 466-5663	Dr. Rodney Durgan COIN Inc. 1546 Hartford Road Maumee, OH 43537 (419) 866-4088
Year Development Began	1976	1978
Principle Designer	Phillip S. Jarvis	Dr. Rodney Durgan
Delivery Systems	IBM (telenetwork or lease) Micros: Apple II Commodore Pet TRS-80 III	Mainframes Minis Other: Search: Micros Information: Microfiche
Preferred Terminal Type	Hard Copy	Hard Copy
On-line Time (per use)	45 min.	30 min.
Costs*	In Canada: $500/mo + Tymenet Lease for IBM: $3600/yr + $20/mo per terminal Lease for Micros: $2000-1st yr, $1000-2nd yr, $1000-3rd yr	For mainframes: $1500 for first terminal $600 for each additional terminal

*These costs are for comparison only. Check with a system representative for actual cost for your site.

DISCOVER I	DISCOVER II
Wynonia Dunn DISCOVER: ACT Center for Computer Based Guidance Systems Shilling Park So. 230 Shilling Circle Hart Valley MD 21031 (301) 628-8000	Wynonia Dunn DISCOVER: ACT Center for Computer Based Guidance Systems Shilling Park So. 230 Shilling Circle Hart Valley MD 21031 (301) 628-8000
1976	1981
Dr. JoAnn Harris-Bowlsbey	Dr. JoAnn Harris-Bowlsbey
IBM 370 or 4300 series	Minis Micros (hard disk and video disc player opt.) Apple II with Corvus hard disc TRS-80 Model II DISCOVER S100 BUS Based Machine IBM Personal Computer
CRT with light pen	Color Monitor
$24,000 perpetual lease fee, unlimited use on one computer. $2000 annual update fee	$1500 first site $800 each additional site $750 annual update fee, each site after first year

	ENCORE	Guidance Information System GIS
Contact for Further Information	Council for Advancement of Experiental Learning Lakefront North #300 Columbia, MD 21044 (301) 997-3535	Linda Kobylarz Time Share Corporation 30 Tower Lane Avon, CT 06001 (203) 674-1141
Year Development Began	1981	1971
Principle Designer	Dr. JoAnn Harris-Bowlsbey	None
Delivery Systems	Micros TRS-80 Model II "CAEL Machine" Apple II upgrade	Mainframes Minis TSC Dolphin Micro Apple III
Preferred Terminal Type	Color Monitor	Hard Copy
On-line Time (per use)		10 min.
Costs*	$1500 first site $750 each additional site $750 annual update, each site (Discounts are available for CAEL members.)	$3100 for first terminal

*These costs are for comparison only. Check with a system representative for actual cost for your site.

Micro-SKILLS	System of Interactive Guidance and Information SIGI	VOCOMP
Marilyn Maze EUREKA Corporation 5625 Sutter Avenue Richmond, CA 94804 (415) 524-4976	Lila Norris Educational Testing Service Princeton, NJ 08541 (609) 921-9000 (609) 734-5565	Margie & Gary Colter Innovative Software 20121 Ventura Blvd. Woodland Hills, CA 91364 (213) 884-5581
1982	1972	1977
Marilyn Maze	Dr. Martin Katz	Margie & Gary Colter
Micros: Apple II	Mainframes Minis TRS-80 II,Micro	CDC Cyber IBM 3033, 370, 360 HP 3000
Black and White or Color Monitor	CRT	Hard Copy or Mail-In Batch Process
20 min.	3.5 Hours	Not Applicable
$490 for perpetual lease fee	$2400 for 1-4 terminals $600 each additional terminal (Micro version costs $1200 for first computer, $600 for each additional computer)	$60 per client (batch processing) $70,000 perpetual lease fee $25,000/yr lease - purchase $7,000/yr optional enhancements $5,000/yr per state data base maintenance

	CAREER SCAN IV AND COLLEGE SCAN	CIS	CHOICES
Career Planning Process			
I. Personal Review II. Assessment			CHOICES GUIDE (Paper-and-Pencil Inventory)
III. Decision Making a. Identify Options	CAREER SCAN	QUEST	EXPLORE RELATED
b. Gather Information	CAREER SCAN	DESC, VISIT BIB, CLUBS	SPECIFIC
c. Assess Desirability of Options			COMPARE
d. Assess Risks e. Select Goal			
Iv. Planning a. Assess Skills Needed		PREP	
b. Identify Training	COLLEGE SCAN	PROG SCH FINAID	
c. Identify Resources for Job Openings		EMPLY JOB SEARCH	
d. Outline Plan			
V. Implementation			

COIN	DISCOVER I	DISCOVER II
	00. 1a. Clarify Values ENTRY 1b. Values and occupations 4. Reviewing Interests & Strengths	1. Self Information a. Interests (90 item interest inventory) b. Aptitudes c. Work Values d. Summary
Occupational Profile	5. Making a list of Occupations to Explore	2. Strategies for Identifying Occupations a. Interests b. Aptitudes c. Work Values d. Occupational Characteristics e. Majors & Programs of Study f. Summary
Occupational File	6. Getting Information About Occupations 7. Narrowing a List of Occupations 7. Narrowing a List of Occupations	3. Occupational Information a. Browse Mode b. Detail Mode
School Subjects File College Major File School File Apprenticeship File Military File	8. Exploring Specific Career Plans 8b. Financial Aid 8c. Apprenticeships 8d. 4-year colleges 8e. Comm. Colleges 8f. Graduate & Professional Schools 8g. Technical/Specialized Schools 8h. Continuing Education 8i. Military 8a. Local Jobs	4. Searches for Educational Institutions & Jobs a. 4-year College Search b. 2-Year College Search c. Technical/Specialized Schools Search d. Job Bank

Career Planning Processes	ENCORE	GIS
I. Personal Review	1. Career Rainbow	
II. Assessment	2. Evaluation of Prior Learning	
III. Decision Making		
a. Identify Options	3. Career Options	Search Method (370 Topics)
b. Gather Information		OCCU ASSOC Local File
c. Assess Desirability of Options		
d. Assess Risks		
e. Select Goal	(Use DISCOVER II or SIGI)	
IV. Planning		
a. Assess Skills Needed	4. Evidence of Prior Learning (How to construct a portfolio)	OCCU
b. Identify Training Opportunities	5. Colleges & Universities Offering Assessment of Prior Learning	COL4, COL2 GRAD, AIDS
c. Identify Resources for Job Openings		Local Files
d. Outline Plan		
V. Implementation		

Micro-SKILLS	SIGI	VOCOMP
Skills Inventory (off-line)	VALUES	
RATE	LOCATE (5 values at a time)	Vocational Planning Fact Sheet
VIEW INFO	COMPARE	Vocational Plan
	STRATEGY	
	PREDICTION STRATEGY	
VIEW	PLANNING	
	PLANNING	Vocational Plan
	PLANNING	

Appendix C

EVALUATING A COMPUTER-ASSISTED CAREER GUIDANCE SYSTEM

PROCESS FOR SYSTEM EVALUATION

1. Analyze your institution's needs and prioritize your institution's objectives for the CACGS.
2. Select at least two clients with different needs and personalities to use each CACGS. Conduct precounseling sessions to define their objectives in using the CACGS and prepare them to stay with it until they get what they need from it. While they are using the CACGS, observe the amount of assistance needed from the CACGS representative.
3. Select three to five occupations from different segments of the labor market which are of interest to your clients, including occupations which are unskilled, apprenticable, licensed or credentialed, professional, declining, and new or expanding. Obtain all available information for each occupation and relevant training programs and educational institutions.
4. For each CACGS identify a computer for use with the CACGS and use the cost formula (Chapter Three) to calculate the maximum and minimum per client cost for operating the CACGS for the first three years (or less if necessary).
5. Gather system literature and research reports to determine the CACGS philosophical orientation and evidence that it meets its objectives.
6. Visit or talk with current user sites to determine their level of satisfaction and areas of difficulty with the system.

After completing these steps to gather information, use the checklist below as a framework for evaluating the system. Be sure to insert your institution's objectives at the appropriate points if they have not been included in the checklist.

When this evaluation has been completed, use your institution's priorities to rate each CACGS. The result of these steps should be three ratings: system's overall functioning (based on the criteria below), system's ability to meet your institution's objectives, and system's cost per client. Your final selection will require balancing these three evaluative measures.

CHECKLIST FOR SYSTEM EVALUATION

I. System Goals
   A. The structure of each CACGS is determined by its philosophical assumptions.
      1. According to system literature, what are the essential elements in the career planning process?
      2. What role is the CACGS intended to play in this process? How much of this process does it attempt to computerize?
   B. The objectives of the CACGS should be similar to those defined by your institution.
      1. What are the outcomes it intends to achieve?
      2. What population is it intended to serve?
   C. After noting the limitations of the CACGS, are these services your site is willing to provide in another way or do without?

II. Didactic Components
   A. Which concepts does the CACGS attempt to explain? Common topics include:
      1. An overview of the career planning process.
      2. The values clarification process.
      3. How to make rational decisions.
      4. The structure of the world of work.
      5. How to use information resources.
      6. The job search process.
      7. How to obtain financial aid.
   B. How effective are these components in teaching the concepts they attempt to teach?
      1. Are the topics presented in an interesting and lively manner?
      2. Are these modules fully interactive?
      3. Is this information relevant to your client population?
      4. Is the material written at an appropriate reading level?

III. Assessment Components
   A. On which topics is the occupational and/or educational selection process based? Commonly used topics include:
      1. Aptitudes
      2. Abilities
      3. Skills
      4. Interests
      5. Client preferences (job or school characteristics)
      6. Values
      7. Personality types

B. Are these assessment components effective in selecting relevant occupations and/or educational programs?
   1. Does the access strategy enhance the career planning program used by your institution?
   2. Are there aids to self-assessment which help the client to answer the questions accurately?
   3. Is there a carefully researched data base which relates the occupations or educational programs to the self-assessment topics?
   4. Is the logic of these components easy to understand and realistic?
   5. Are the topics relevant to your clients?
   6. Do these modules make full use of the interactive capabilities of the computer?
   7. Is the reading level appropriate to your clients?

IV. Information Components
   A. Which types of information are covered? Common types of information include:
      1. Occupational descriptions
      2. Educational programs and institutions
      3. Bibliographic resources
      4. Military occupations and training programs
   B. How well are these topics covered?
      1. How detailed are each of the descriptions?
      2. Is the reading level appropriate for your clients?
      3. Are the files updated frequently and is the information accurate?
      4. Is it possible for individual sites to add local data?
      5. Is the information localized to your region or state?
      6. What sources are used to collect data?
      7. What philosophy is used in interpreting the data?

V. Internal Structure
   A. How easy is the CACGS for an unsophisticated client to use?
      1. Are all parts of the system cross-referenced to other parts to facilitate movement between components?
      2. Are the instructions easy to understand?
      3. Does the CACGS allow the client flexibility in deciding in which order to use the components?
      4. Is the system adaptable to the complex needs of your clients?

B. How was the system intended to be used?
   1. How much time does the average user need?
   2. How many sessions do most users need?
   3. Does the system store a record of the client's progress?

VI. System Management
   A. There should be support materials which clearly explain the structure of the system for counselors and supplement the computerized materials in special situations.
      1. Does the counselor's manual explain the objectives and logical structure for each component?
      2. Are user materials easy for your client population to understand and available in sufficient quantities?
      3. Are there audio visual aids to supplement verbal instructions for poor readers?
      4. Are there exercises and activities recommended for special populations?
      5. Is there a manual sorting process which can be used when the computer is not available?
      6. Are the information files available in books or microfiche when the computer is not available?
   B. CACGS should provide technical support and should be responsive and prompt in fulfilling their commitments.
      1. Is in-service training available from professionals who understand the counseling process?
      2. Is the CACGS responsive to the suggestions from users?
      3. Does the CACGS actually keep the data as up-to-date as it claims and are the updates produced on a dependable schedule?
   C. CACGS should have evidence of careful evaluation during their formation and continuing evaluation annually.
      1. Has the CACGS been carefully evaluated to determine its effect on users?
      2. Is there a process for collecting data about usage at each site?
      3. Is there an ongoing evaluation process for the system as a whole?

VII. System Requirements
   A. What types of hardware are recommended for usage with the CACGS? Specifications should include:
      1. Computers
      2. Terminals
      3. Telecommunication modes
      4. Other optional or recommended equipment

B. Does the hardware you plan to use have a good record of dependability in settings like yours?
   1. How much down time does the computer average per year?
   2. Can the log-on procedures be simplified for your setting?
   3. Have other sites using similar equipment found it reliable?

C. What is the per user cost of this CACGS in your setting? (See cost formula in Chapter Three for assistance in calculating the per user cost.)

APPENDIX D

RESOURCE CENTERS FOR VOCATIONAL GUIDANCE

I. GENERAL RESOURCE CENTERS

ACSCI Clearinghouse
247 Hendricks Hall
University of Oregon
Eugene, Oregon 97403
(503) 686-3872

Appalachia Educational Laboratory
Division of Career Guidance
Box 1348
Charleston, West Virginia 25325
(304) 347-0400

Educational Testing Service
Princeton, New Jersey 08540
(609) 921-9000

National Center for Research in Vocational Education
Ohio State University
1960 Kenny Road
Columbus, Ohio 43210
(800) 848-4815

National Occupational Information Coordinating Committee
400 6th Street SW, Rm 3742
Washington, D.C. 20202
(202) 653-7680

Wisconsin Vocational Studies Center
University of Wisconsin—Madison
1025 West Johnson Street, Room 964
Madison, Wisconsin 53706
(608) 263-2704

Note: Publications lists are available on request from each of these agencies.

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Alabama Occupational Information Coordinating Committee
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Montgomery, Alabama 36130
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Alaska Career Information System
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State Office of Research and Development
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Tallahassee, Florida 32303
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Fuji Adachi
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Wyoming Career Information
System
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Laramie, Wyoming 82071
(307) 766-6189

HOW TO SELECT A

Computer Assisted Career Guidance System

For those who now subscribe to a computer-assisted career guidance system as well as those who are in the process of selecting one, this practical, easy-to-read book explains the complex marriage between computers and guidance. It is also the first book to present a process for choosing among the multitude of systems available and to provide guidance in effectively utilizing a system once it is selected.

Marilyn E. Maze is the Director of EUREKA, the California Career Information System, and has spent several years explaining those concepts to counselors and advisors. Her experience in both career counseling and computer programming gives her the depth of understanding needed to explain these concepts clearly.

Roger W. Cunningham, a professor of counseling at San Francisco State University, taught the first course in computerized guidance in 1968 and has been training counselors for fifteen years.